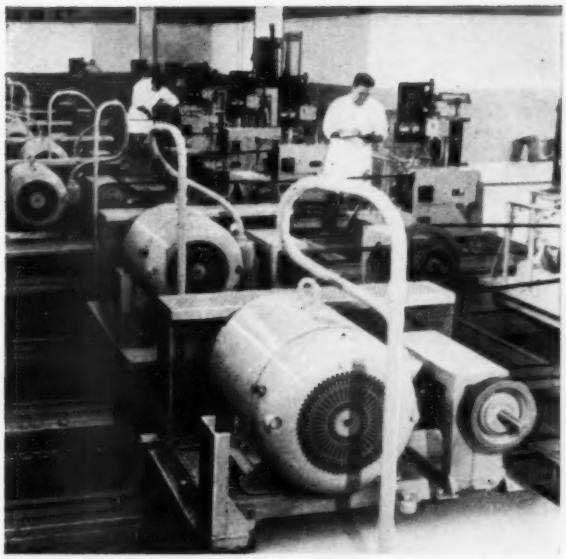
Why V-Belts with the Green Seal meet every test



Nearly one-third of all electric power used at the Goodyear V-Belt plant goes into testing, checking and development operations. These giant dynamometers, for example, test larger belts in all speed ranges and with various pulley diameters—with belt loads from zero to 100 h.p. The effects of reverse bending, various placements of idlers and high or low tension are also checked.

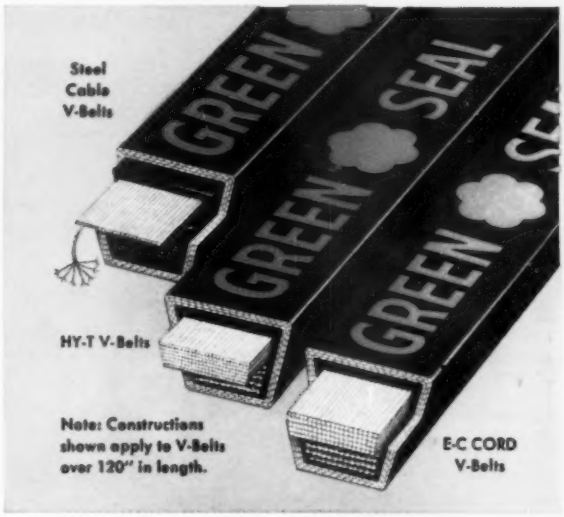
Dimensional stability! Belts are even test-run in closed, high-temperature ovens—to verify that their 3-T (Triple-Tempered) construction remains dimensionally stable under extreme operating conditions.

Perfectly matched sets! Belts are carefully measured on ultra-precision machines – then carefully coded to guard against "loafers" – or belts that overwork.

High strength, low stretch! Belts are subjected to "breaking point" tensile-strength tests in the Goodyear laboratories – to insure long, trouble-free service on your drives.

Maximum resistance to shock-loads! Belts are "tortured" on special machines that simulate the severest service – your protection against early belt failure.

Clean, smooth-running operation! Special nondusting rubber cover compounds are continually tested for friction balance – to give you freedom from sticking or grabbing in the grooves.



To pay off in—

Maximum trouble-free horsepower hours at minimum cost. That makes it a real gamble to settle for anything less than V-Belts with the Green Seal. See your Goodyear Distributor – or write Goodyear, Industrial Products Division, Lincoln 2, Nebraska, or Akron 16, Ohio.

DIMENSIONALLY STABLE V-BELTS with the GREEN SEAL by

GOODYEAR

60th ANNIVERSARY

THE GREATEST NAME IN RUBBER

Green Seal, E-C Cord, Hy-T –T. M.'s The Goodyear Tire & Rubber Company, Akron, Ohio

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'ROUND ABOUT

with the editors in field and office

Edited by R. L. Marinello

Metal Lath Specifications

HERE IS A helpful specification book which will serve as a handy reference guide when ordering or working with metal lathing and furring.

Technical points referred to in this booklet include: specifications for solid and hollow partitions; wall furring; metal lath attached directly to wood supports; contact, furred and suspended ceilings; beam and column protection for fireproofing; and reinforcing for exterior stucco.

In addition to descriptive tables summarizing the various spans and spacings for supporting metal lath and plaster ceilings, the specifications include a page on fire-resistant ratings.

A copy of this booklet may be obtained by writing to the Metal Lath Manufacturers Association, Engineers Building, Cleveland, Ohio.

New Appointments at Chrysler

Louis Mayorchalk, formerly plant engineer of the Parts and Equipment Division has been appointed manager, plant engineering of the McGraw Stamping plant of Chrysler Corporation, Detroit, Michigan.

Albert Schievenin, formerly maintenance superintendent of Chrysler's

Mayorchalk

Schievenin

Stamping Division, has been promoted to plant engineer of the Conant Stamping plant.

Mayorchalk has been employed with the company since 1928. His first position was as a draftsman. Other jobs were estimator in plant engineering department and plant layout work. In 1941, he served as assistant to the plant engineer and later was promoted to plant engineer.

Schievenin began employment with the company in 1934. He worked as a machine repair apprentice, machinery inspector and maintenance coordinator, supervisor of government machinery and equipment processing, field engineer, and general maintenance superintendent.

How To Un-Engineer Your Job

HOW NOT TO be an engineer is the best way to describe the booklet which tells an engineer all the things he should do if he wants to un-engineer his job.

Here are just a few examples of the many comments, illustrated with egghead characters, which appear in this 32-page booklet.

"It's not enough to be difficult, you must be impossible. This will make sure you are noticed by the front office. Make them realize you are an engineer."

"Make it look difficult. If it's simple, any fool could have done it, and it lowers your professional standing. Also, your associates will resent you for giving the game away."

"If you suspect a solution is wrong, try it to make sure. There's no better way to prove your point."

Copies of this booklet "On Being an Egghead or Engineermanship" are available from Benson-Lehner Corporation, 11930 Olympic Blvd., Los Angeles 64, California.

Flooring Problems and Answers

SUBJECTS FOR discussion at a Building Research Conference will be based on a flooring questionnaire conducted by the BRI. The conference will be held at the Sheraton-Park Hotel, Washington, D. C., on September 17 and 18.

Replies to the questionnaire will contain data on the appearance, comfort and service characteristics of seven types of floor covering, and experience encountered with every kind of floor system.

In addition to a series of reports by experts on flooring design, manufacture and installation, the two-day conference will feature an open workshop discussion after each day's session.

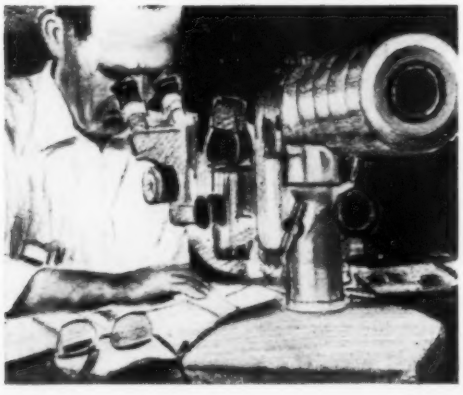
Program and registration informa-

Subscriptions: U.S.A. $10, Canada $11. Other countries $12 per year. Single copies $1. Change of address: Send to PLANT ENGINEERING, Circulation Division, Barrington, Illinois. Please supply position title, company name, company address. Request must reach us by 15th of month to make the change effective with following month's issue. Published monthly and accepted as controlled circulation publication at Chicago, Ill.

A Byers field service representative can relate new 4-D Wrought Iron test results to the specifier's corrosive applications.

Laboratory and field test results lend added support to 4-D Wrought Iron specs

Our metallurgical staff compiles and analyzes great funds of data on corrosion-resistant materials.



With some products, a company representative's natural enthusiasm is often *tempered* by actual test results in the laboratory.

Not so however, with new 4-D Wrought Iron. Byers field service engineers can present research facts which confirm the increased corrosion-resistance of this new product.

Comparative testing with standard Wrought Iron, as well as many ferrous substitutes, proves new 4-D Wrought Iron a decidedly superior deterrent to corrosion. So the wisdom of standard Wrought Iron specifications may now be further enhanced by specifying new 4-D Wrought Iron.

Byers field service engineers are lending even more credibility to this story with their own knowledge of corrosive infighting. The Byers representative will welcome an opportunity to relate these test results to your corrosive applications. Call him soon. Or, write us for helpful literature on new 4-D Wrought Iron. A. M. Byers Company, Clark Building, Pittsburgh 22, Pa.

BYERS WROUGHT IRON

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PROTECT
Your Machinery
with...
THOMAS ALL METAL
FLEXIBLE COUPLINGS

NO LUBRICATION
NO MAINTENANCE
NO WEARING PARTS

Future maintenance costs and shutdowns are eliminated when you install Thomas Flexible Couplings. These all-metal couplings are open for inspection while running.
They will protect your equipment and extend the life of your machines.
Properly installed and operated within rated conditions, Thomas Flexible Couplings should last a lifetime.

UNDER LOAD and MISALIGNMENT ONLY THOMAS FLEXIBLE COUPLINGS OFFER ALL THESE ADVANTAGES.

1 Freedom from Backlash Torsional Rigidity
2 Free End Float
3 Smooth Continuous Drive with Constant Rotational Velocity
4 Visual Inspection While in Operation
5 Original Balance for Life
6 No Lubrication
7 No Wearing Parts
8 No Maintenance

Write for Engineering Catalog

THOMAS FLEXIBLE COUPLING CO.
WARREN, PENNSYLVANIA, U.S.A.

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'ROUND ABOUT

tion may be obtained by writing to Harold Horowitz, Technical Secretary, Building Research Institute, National Academy of Sciences, 2101 Constitution Ave., Washington 25, D. C.

Engineers to the Rescue

INDUSTRIAL MEDALS of honor were presented by the U. S. Bureau of Mines to Frederick W. Pfau, maintenance superintendent, and one of his assistants, Nelson G. Fry. These men, both with International Salt Co., Inc., Detroit, Michigan, were rewarded for their heroic efforts in saving the lives of six men. The men were trapped in a mine cage at the company's salt mine when an elevator cable snapped. A safety device halted their fall and left the cage suspended 250 ft below the surface and 900 ft above shaft bottom.

Lowered in a bosun's chair, Pfau and Fry first brought up the length of broken cable that had fallen on the cage and then the six trapped men.

Mr. Pfau is a member of the Plant Engineers' Society of Detroit, a chapter of the American Institute of Plant Engineers. He has served as treasurer and executive board member of the Detroit Chapter.

October Conferences and Shows

PAPERS TO be presented at the ASME-ASLE Lubrication Conference will cover a wide range of subjects. The conference will be held at the Statler Hotel, Los Angeles on October 13, 14 and 15.

The National Industrial Packaging, Handling and Shipping Show will be presented in Chicago from October 13 through the 16. In addition to the exhibits, they will have a technical short course program.

October 27 through the 31st are the dates of the National Metal Exposition and Congress. The place will be Cleveland's Public Auditorium. For more information contact American Society for Metals, Cleveland 3, Ohio.

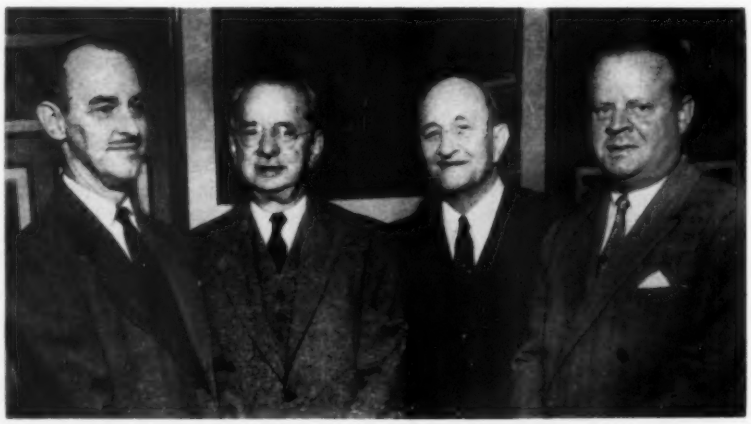
Plant Engineer Tishlarich and Superintendent Schaefer Retire

TWO MEN with a total of 102 years of experience in the fabrication of wrought iron recently retired from A. M. Byers Company, Pittsburgh, Pa. They are:

Ottmar M. Tishlarich, assistant to the general superintendent and plant engineer at the company's Pittsburgh plant, and **George M. Schaefer**, night superintendent at the same plant.

Mr. Tishlarich received his engineering education at the Carnegie Institute of Technology. He maintains active membership in the American Iron & Steel Institute, Iron and Steel Engineers, the Pittsburgh Plant Engineers Society—a Chapter of the American Institute of Plant Engineers, Engineers Society of Western Pennsylvania, American Society for Testing Materials and the American Petroleum Institute.

Mr. Schaefer, who started with the company as a 12-year-old apprentice in the Tong Weld mill in August, 1900, has spent all but four years of his working life with Byers. He left the company in 1905 to gain additional experience at other steel mills but returned as a weighman in 1909.



Retired employees pose with plant executives. Left to right: H. S. Thompson, general superintendent, O. M. Tishlarich, plant engineer and assistant to Mr. Thompson, G. M. Schaefer, superintendent; B. M. Byers, president, A. M. Byers Co.

for greater strength . . . easier assembly

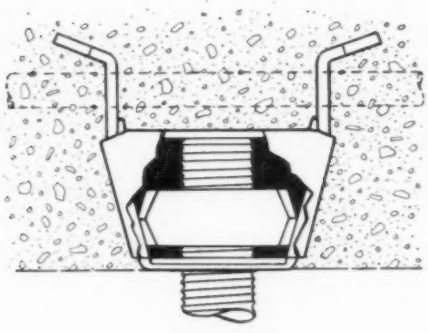
The new Grinnell Wedge Type Concrete Insert

Fig. 281

NEW design features give Grinnell's Wedge Type Concrete Insert (Fig. 281) greater load carrying capacity . . . 1200 lbs. for ⅝" and ¾" sizes, with a safety factor of at least 5 to 1.

Heavy gauge steel is die-formed into a wedge-shaped box housing. When load is attached to the inserted nut and rod assembly, ends of the elongated nut press on the wedge-slanted walls.

These walls, acting in compression with the concrete, provide strength unmatched in steel inserts of equal size.



Preassembly of the elongated nut on the rod makes quick assembly possible.

Installations can be made in quick time, too. Just a few turns of the rod tighten the nut rigidly in place. Slightly loosening the nut permits lateral adjustment along the full length of the slot, without fear of rod and nut falling out of the body.

Single body size accommodates four different interchangeable nut and rod sizes, to make ordering easier and installation simpler—especially where hanger rod sizes cannot be determined in advance of ceiling construction.

On your next project, specify Grinnell Concrete Inserts — either steel or malleable iron. Quality manufactured . . . *and priced right!* Grinnell Company, Inc., Providence 1, R. I.

CB-Universal Malleable Iron Concrete Insert (Fig. 282)

CB-Junior Malleable Iron Concrete Insert (Fig. 279)

Wrought Steel Concrete Insert (Fig. 280)

GRINNELL

PIPE HANGERS AND SUPPORTS

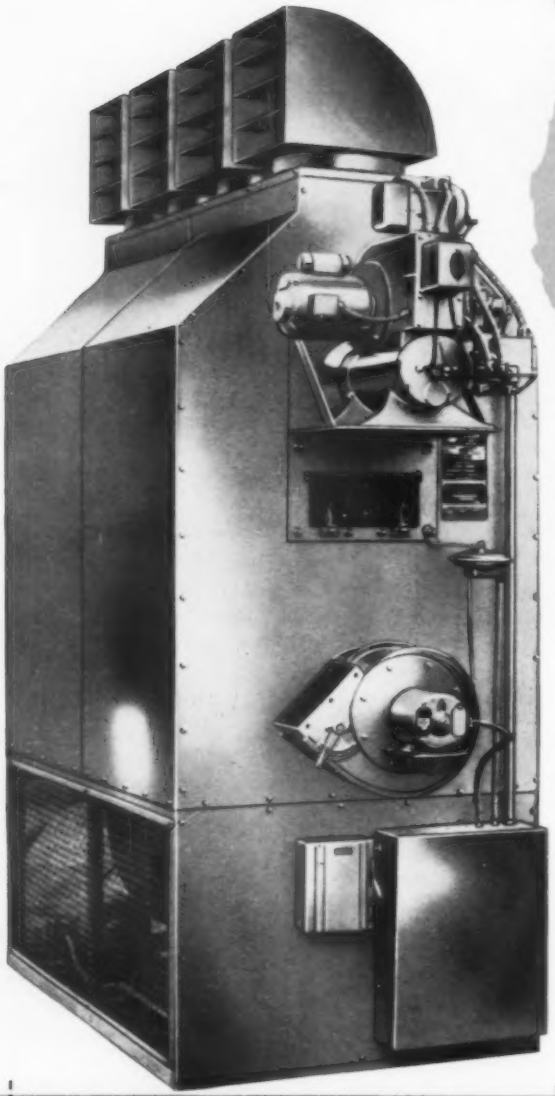
Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermolier unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic fire protection systems • Amco air conditioning systems

For more facts circle 505 on Reply Card

LENNOX TEAMWORK on call

for every INDUSTRIAL HEATING



Thirty-seven LENNOX sales representatives team up with factory personnel in 10 strategically located LENNOX plants — to supply *any* type industrial heating equipment you might require.

Only LENNOX, world leader in warm air heating, can put sales application facilities like these at your beck and call — at a moment's notice. You may be assured that your nearby LENNOX sales representative is, himself, a qualified heating specialist. He is wholly familiar with the modern concept of industrial warm air heating and air conditioning which your plant requires. The added resources of factory consultation make him the best qualified heating man you can contact.

Whatever your heating problems (see facing page), the six different Lennox "AT" Industrial Heater models, in 8 capacities, can meet your exact requirements—with greater economy and efficiency. Direct fired heaters from 400,000 to 2,000,000 Btuh . . . using oil, gas or combination fuel.

MAIL THIS COUPON today for full engineering details on Lennox heavy-duty *4-pass counter flow design* and other exclusive design benefits.

MAIL COUPON - - *Today*

LENNOX INDUSTRIES INC.
Industrial Division, Dept. P-8
1701 East Euclid, Des Moines, Ia.

Please send me—without obligation—complete specifications and engineering data on Lennox AT series Industrial Heaters.

Name_____

Company_____

Address_____ City_____

Title_____

LENNOX Industries Inc.

INDUSTRIAL DIVISION · 1701 East Euclid

AIR CONDITIONING & HEATING

A typical "hot and cold" deck system of heating and air-conditioning uses a Lennox "AT" heat exchanger section in parallel with cooling coils to condition the atmosphere of this department store. Proportioning dampers and modulating burners on the "AT" units provide fuel economy and zone temperature control.

JOB

☆ Locates Lennox plants

● Locates Lennox sales representatives

(Canadian plants located at Toronto and Calgary.)

HEATING & VENTILATING

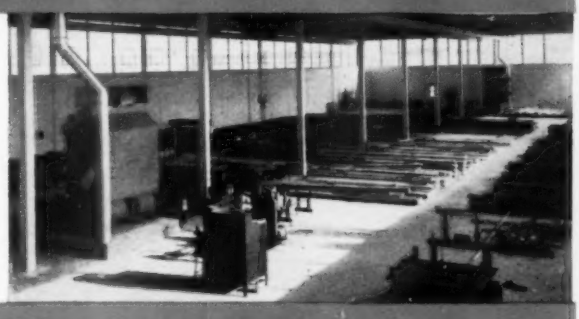
This food warehouse (with over 100,000 square feet of floor space, including a loading dock) is heated by five Lennox "AT" Industrial Heaters. Two of the heaters in the dock area blanket the loading doors with warm air, at the same time replacing the exhaust-laden atmosphere. Even temperatures are maintained throughout the building.

SPACE VENTILATION

One 2,000,000 Btuh Lennox "AT" Industrial Heater provides heating and ventilation for this large printing company. This single heater, equipped with modulating burner control and both fresh air and recirculating air dampers, provides economical heat and pure air for the printing area — where atmospheric conditions are vitally important to employees' health and productivity.

SPACE HEATING

This steel warehouse with over 20,000 square feet of floor space is heated by two oil-burning Lennox "AT" Industrial heaters. Heated air is discharged at high velocity from directional nozzles above the heads of workers, providing a comfortable, even temperature in the working area, with minimum heat loss at ceiling level.



MAKE-UP AIR

A typical installation uses two "AT" 175-G gas-to-gas heaters for make-up air in this 20,000 square foot factory where numerous paint booths with exhaust fans remove large quantities of contaminated air. Modulating burners conserve fuel—while proportioning dampers permit recirculation and provide fresh air for comfortable working conditions. Units remotely located.

• *Des Moines, Ia.*

For more facts circle 506 on Reply Card

as at Gillette begins with

GILLETTE SAFETY RAZOR CO.
BOSTON, MASSACHUSETTS

At the headquarters of the world's leading manufacturer of shaving equipment, nine OTIS Freight Elevators play an important part in the factory operation. GILLETTE's primary interest is in keeping them operating at peak efficiency at all times. The material they move is vital to a continuous production set-up.

GILLETTE's engineering department also likes the idea of having all expenses known in advance. It permits easy budgeting on a monthly basis. There's never the annoyance of unexpected or costly repair bills that have to be added to shutdown costs. It is this double freedom from costly repairs and shutdowns that has kept GILLETTE sold on OTIS Maintenance through the local OTIS office for fifteen years.

Trouble-free freight elevator service starts with a FREE Otis Maintenance Survey and Estimate. Our approach is illustrated at the right.

Only OTIS Maintenance offers "engineered service" by the maker that maintains and assures peak performance at all times. Original or improved replacement parts are always available regardless of the age of the installation. All parts are replaced in advance of their breakdown point to maintain the maker's high standard of safety.

Your local OTIS office will gladly make a FREE Maintenance Survey and Estimate for you.

Otis freight elevator

"ENGINEERED SERVICE BY THE MAKER"

OTIS ELEVATOR COMPANY • 260 ELEVENTH AVENUE • NEW YORK 1, N.Y.

trouble-free elevator service
a FREE OTIS maintenance SURVEY

OTIS MAINTENANCE SURVEY AND ESTIMATE
What are your elevator maintenance costs?
It really takes an elevator man to figure costs accurately. This survey form shows the start of our procedure.

maintenance "that keeps freight elevators running like new"

OFFICES IN 297 CITIES ACROSS THE UNITED STATES AND CANADA

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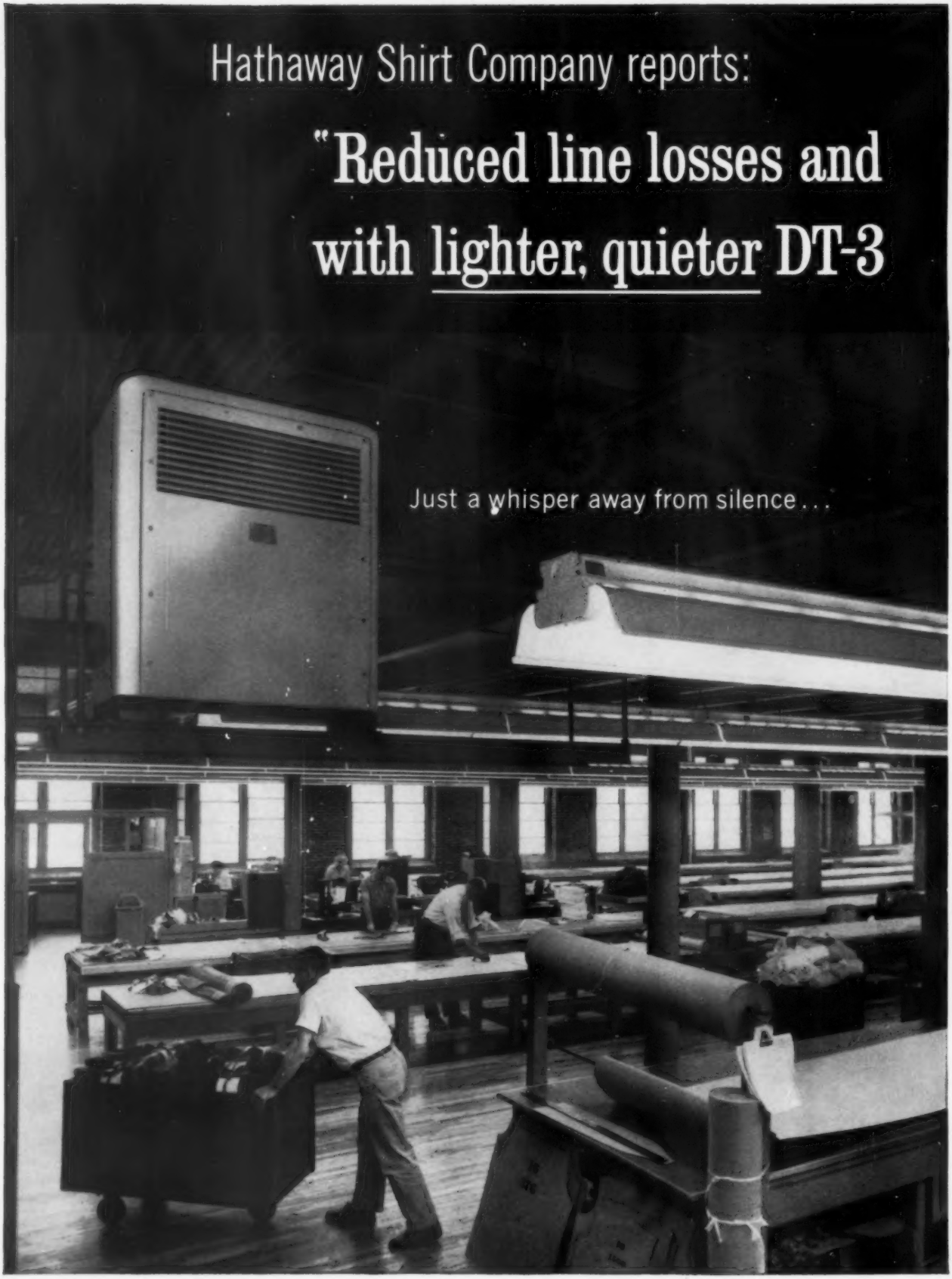

Hathaway Shirt Company reports:
"Reduced line losses and
with lighter, quieter DT-3
Just a whisper away from silence...

maximum power utilization... transformers at the load center"

The nation's oldest shirt manufacturer, The C. F. Hathaway Shirt Company, uses 18 Westinghouse DT-3 dry-type transformers to supply dependable power for the 543 machines and 2722-fixture lighting system in its Waterville, Maine plant. Consolidating production facilities of Hathaway's two previous Waterville factories, this building was remodeled and completely rewired before its opening in April, 1957.

"These lightweight, small Westinghouse transformers were easily suspended from the ceiling by 5/8-in. steel rods," states Mr. Frederick F. O'Connell, Superintendent of Maintenance for the Hathaway plant. "This, together with their low sound level, allowed us to place them next to the machines that they supply, reducing line losses to a minimum and giving us maximum utilization of electric power.

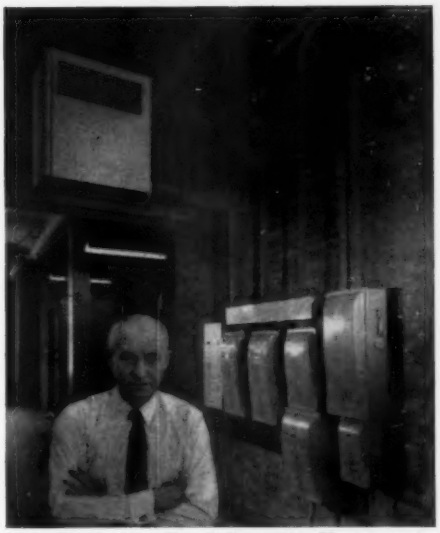
"Maintenance is no problem with our Westinghouse dry-type transformers," continues Mr. O'Connell. "Once a year we wipe them down with a damp cloth; three or four times a year, we clean them with a feather duster. That's all. There's no fluid level to check, no filters to change.

"These transformers," Mr. O'Connell concludes, "have provided us with a quiet, trouble-free, compact, space-saving, low-maintenance power distribution system."

If your plant is a victim of undervoltage, it's time to POWER-UP — or if you are planning a new factory, you can POWER-UP from the start. Ask your Westinghouse representative or your utility power sales engineer for specific recommendations to fit your problem.

And for complete information on the DT-3 transformer, call your local Westinghouse salesman or distributor, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania. J-70889

Architect—Emil F. C. Backstrom, New York City
Consulting Engineer—Alfred J. Kleinberger, New York City
Electrical Contractor—The Dole Company, Bangor, Maine



Mr. Frederick F. O'Connell, Hathaway's Superintendent of Maintenance — with friend. The shirt: a Hathaway, of course! The friend: a DT-3!

Operating "just a whisper away from silence," this DT-3 brings power right to the load center for Hathaway shirt cuff presser, Marie Tingley.

◀ Lightweight DT-3 hangs *quietly* here in the cutting room where material is cut from patterns for popular Hathaway shirts.

YOU CAN BE SURE...IF IT'S Westinghouse

For more facts circle 508 on Reply Card

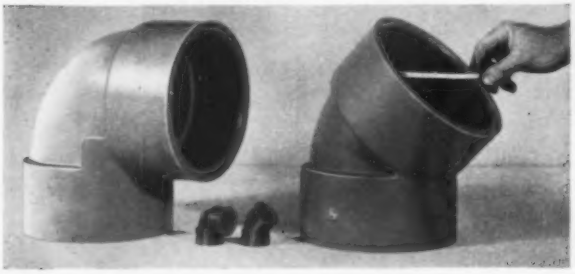
UPVC PIPING NEWS

PUBLISHED BY TUBE TURNS PLASTICS, INC. • LOUISVILLE 1, KENTUCKY

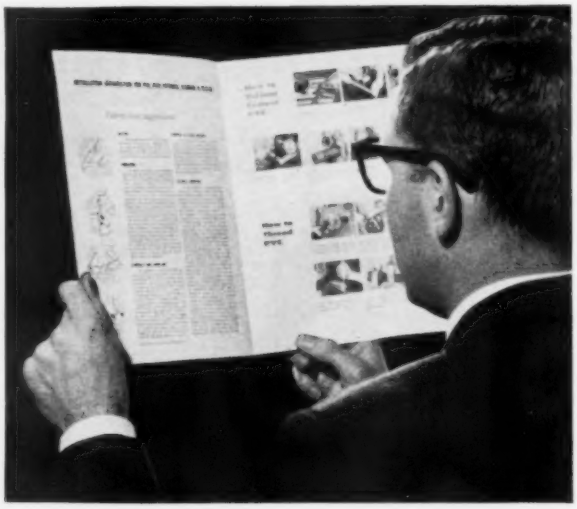
EVIDENCE OF UPVC QUALITY. The **ttp** lift check valve shown at the top had operated 15 million cycles when removed for inspection. It carried a 10-15% sulfuric acid solution with sand in suspension. Where metal valves lasted about 9 months, this UPVC valve shows no sign of wear after 13 months.

The lower illustration shows a disassembled **ttp** plug valve after two years' operation *in throttling position*, carrying salt water plus sand. This UPVC product shows no deterioration due to abrasion under this severe service.

To guard against cheap substitute PVC materials, insist on the **ttp** brand. These products are made from *unplasticized* PVC!



NOW 6-INCH. You can now fight corrosion with 6-inch UPVC piping, installed at minimum cost, with **ttp** fittings and flanges. These new products are available in schedule 80, socket type with female end for solvent cementing—or male end for flanged connections, and also victaulic grooved ends.



TO CUT COSTS . . . You can save money two big ways with UPVC piping: (1) Lower first cost than other corrosion resisting materials; (2) lower maintenance costs. Full details, plus valuable application and installation data are given in Catalog 119.

THE COMPLETE LINE of **ttp** products is available quickly from your nearby **ttp** distributor. His stock includes fittings, flanges, valves, solvent cement, thread lubricant. And he can help you on installation problems. Above: At C. A. Roberts Company, Indianapolis, Indiana.

TUBE TURNS PLASTICS, INC.

AN AFFILIATE OF CHEMETRON CORPORATION

Dept. PE-8, 2929 Magazine Street • Louisville 11, Kentucky

CHEMETRON

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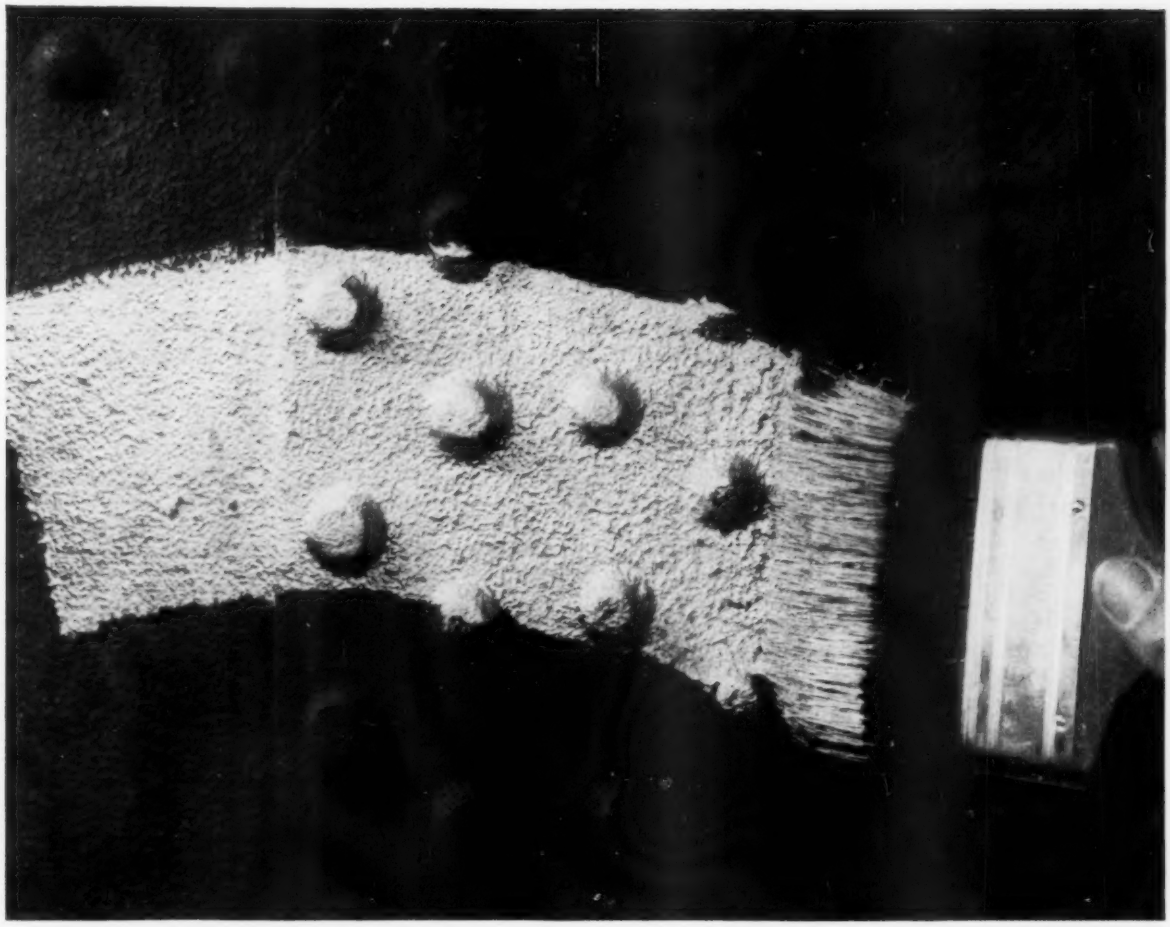


NEW GULF METALCOAT A protects against rust up to 10 times longer

Now you've got a stronger ally than ever, in the war against rust and corrosion. New Gulf Metalcoat A . . . the revolutionary new aluminum pigmented liquid coating . . . protects metal surfaces up to 10 times longer—under the most severe exposures in industrial and marine atmospheres.

Salt spray tests at Wrightsville Beach, N. C. proved that new Gulf Metalcoat A gives 7 to 10 times greater protection than competitive products. And before its introduction, nine years of intensive exposure tests proved its extraordinary rust preventive properties.

Where and how to use New Gulf Metalcoat A

Outdoor piping, vents, fences, transportation equipment, bridges, ships, metal roofs, stacks—practically any type of steel structure can be protected longer with New Gulf Metalcoat A. Economically, too!

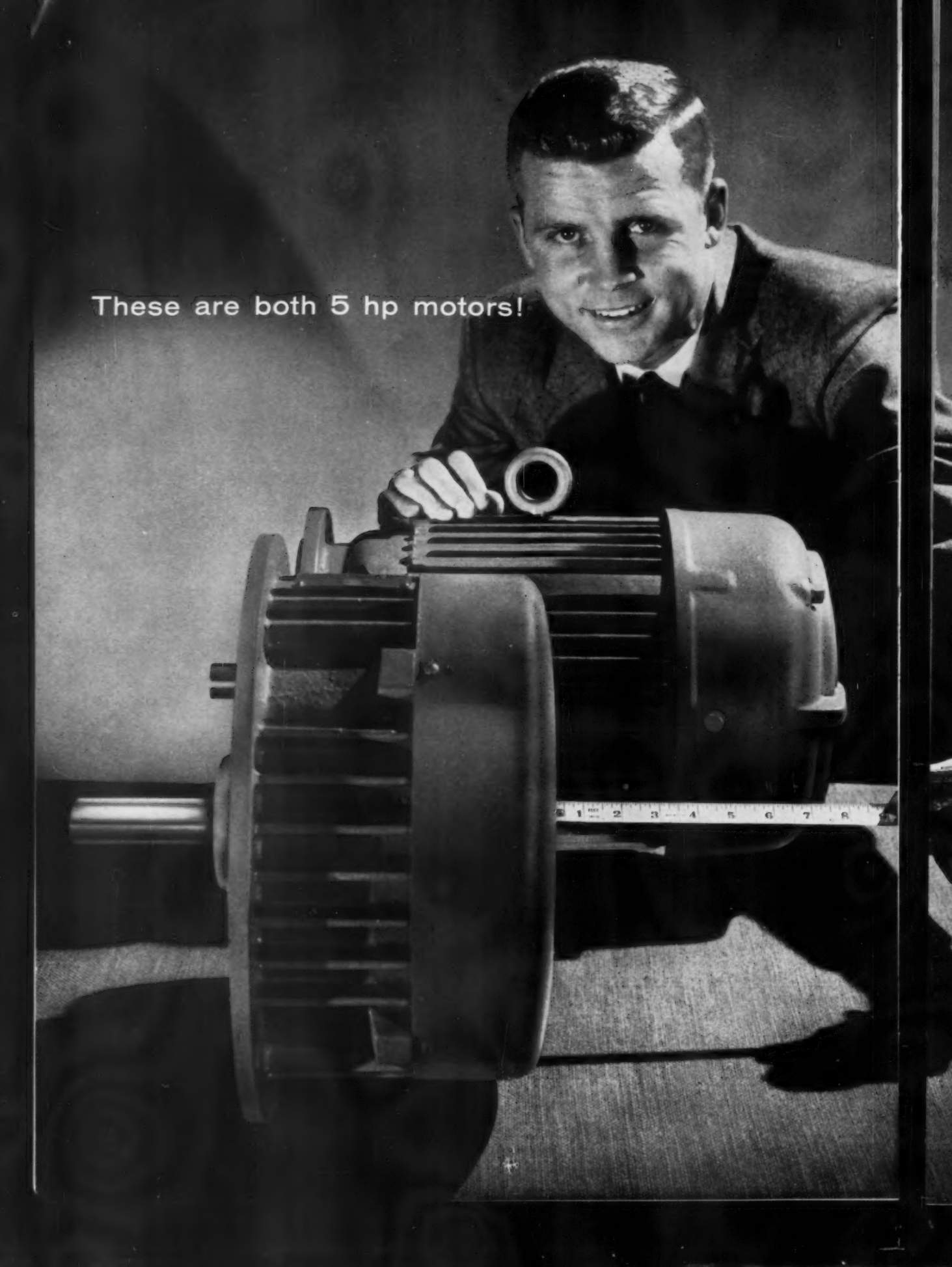
Brush, dip or spray either smooth or rough metal surfaces. In cases where only temporary protection is desired, New Gulf Metalcoat A can be removed easily with a petroleum solvent.

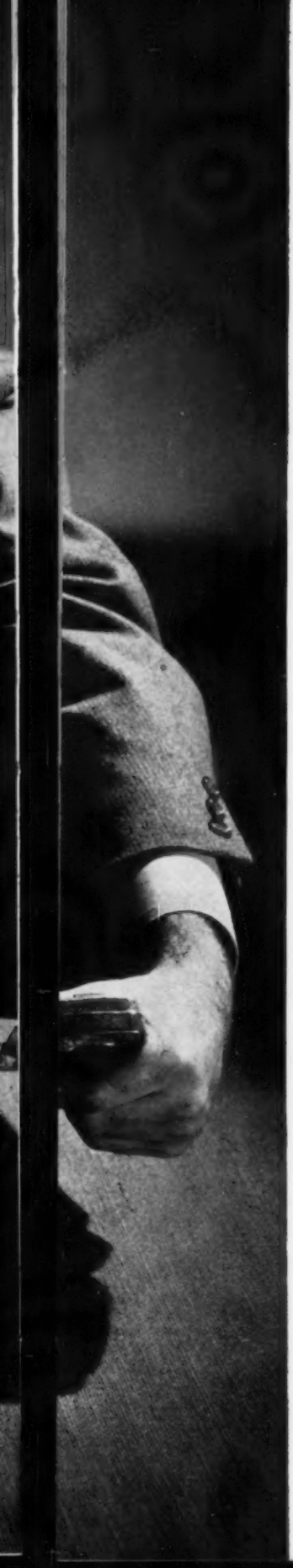
Your Gulf Sales Engineer can show you how much less it costs to get longer protection against rust and corrosion, with New Gulf Metalcoat A. Just call him, at the nearest Gulf office.

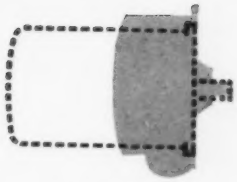
GULF OIL CORPORATION
Dept. DM, Gulf Building
Pittsburgh 30, Pa.

GULF

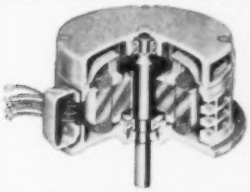
For more facts circle 510 on Reply Card


These are both 5 hp motors!





SAME NEMA RATING IN
60% LESS SPACE



PERFORMANCE-PROVED RADIAL
AIR-GAP DEPENDABILITY

New-product news from Louis Allis

60% shorter–
but with radial air-gap design!

New Louis Allis Pancake Motor preserves all the advantages of conventional motor construction

The new Louis Allis Pancake Motor is your solution to trouble-free power in any space-cramped motor application.

The Pancake is a remarkably short flange-mounted motor — up to 60% shorter and 33% lighter than standard motors of the same rating! And it is built in *conventional* radial air-gap design!

It's done by an ingenious forming process which literally compresses the end coils of a conventional radial air-gap motor into an exceptionally short length. The result is a compact, light motor ideally suited for horizontal or vertical mounting on machine tools, roof ventilating fans, or *any* close-quarter installation where space is a critical design factor.

What's more, this is achieved without sacrificing a single desirable characteristic: the stator still contains the same iron and copper as standard Louis Allis motors . . . standard NEMA service factor is maintained . . . high insulative values are retained by using proved Louis Allis varnishes and new insulating techniques . . . over-sized pre-lubricated bearings are used to guarantee long bearing life . . . and the entire motor is enclosed in an industrial-type cast-iron housing designed to shrug off abuse!

The housing and flange are cast in one piece: this permits extra-accurate internal machining which extends bearing life and reduces noise levels to a new low.

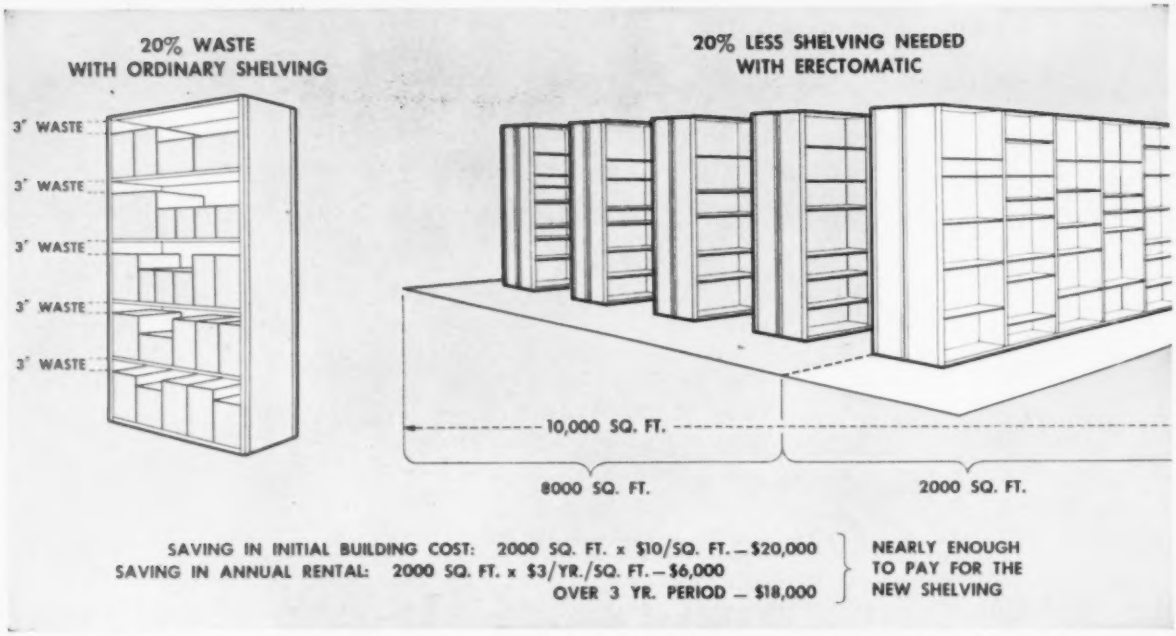
Investigate the Pancake Motor through your local Louis Allis District office. Sized from 1 to 15 hp, at 1800, 1200, and 900 rpm, in open drip-proof and enclosed non-ventilated or fan-cooled enclosures. Write for Bulletins 2100 and 2150 to the Louis Allis Co., 434 E. Stewart St., Milwaukee 1, Wisconsin.

MANUFACTURER OF ELECTRIC MOTORS AND ADJUSTABLE SPEED DRIVES

LOUIS ALLIS

For more facts circle 511 on Reply Card

SM-104



A typical example of the savings in space made possible by Hallowell ERECTOMATIC steel shelving is illustrated above.

8000 square feet of Hallowell *ERECTOMATIC* Steel Shelving can hold as much as 10,000 square feet of ordinary shelving

Reduction in floor space and shelving is made possible by quick-change shelf positioning and exclusive corner post construction, permitting more effective utilization of area between shelves.

More effective utilization of the area between shelves can provide major savings in industrial and commercial shelving installations—whether you own, rent, or are planning to build the area required for storage.

Hallowell ERECTOMATIC® Steel Shelving permits such utilization. Quick-change shelf positioning eliminates waste in vertical spacing, increases the usable storage area by as much as 20%. Exclusive corner post construction permits full utilization of shelf width, too. Typical savings in initial building costs and annual costs are listed in the tables opposite. Ask your authorized Columbia-Hallowell dealer for details.

Or write Columbia-Hallowell Division, SPS, Jenkintown 26, Pa. or SPS Western, Santa Ana, Calif.

SAVINGS IN INITIAL BUILDING COSTS
(per 100 sq. ft. of storage space eliminated)

% floor space saved by ERECTOMATIC	Building cost per 100 sq. ft.								
	$700	800	900	1000	1100	1200	1300	1400	1500
5.....	$ 35	40	45	50	55	60	65	70	75
10.....	70	80	90	100	110	120	130	140	150
15.....	105	120	135	150	165	180	195	210	225
20.....	140	160	180	200	220	240	260	280	300

SAVINGS IN ANNUAL COST
(per 100 sq. ft. of storage area saved)

% floor space saved by ERECTOMATIC	Cost (per year) per 100 sq. ft.									
	$100	200	300	400	500	600	700	800	900	1000
5.....	$ 5	10	15	20	25	30	35	40	45	50
10.....	10	20	30	40	50	60	70	80	90	100
15.....	15	30	45	60	75	90	105	120	135	150
20.....	20	40	60	80	100	120	140	160	180	200

SPS

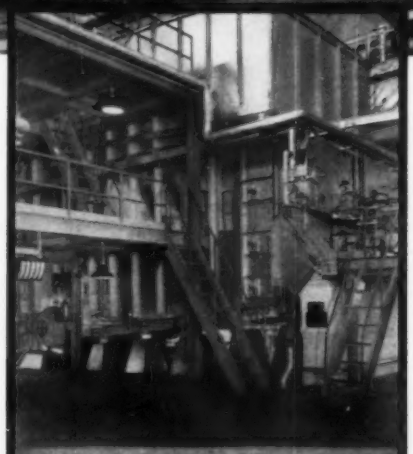
Jenkintown • Pennsylvania

Standard Pressed Steel Co. • The Cleveland Cap Screw Co. • Columbia Steel Equipment Co. • National Machine Products Co. • Nutt-Shel Co. • SPS Western • Standco Canada Ltd. • Unbrako Socket Screw Co., Ltd.

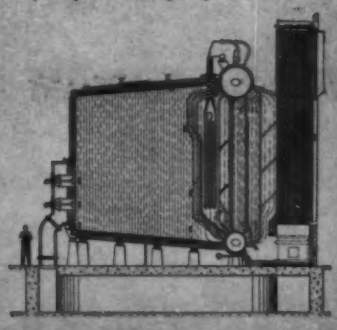
For more facts circle 512 on Reply Card

C-E Boilers exceed guarantees at ANHEUSER-BUSCH, Inc.

The Newark, N. J., brewery of Anheuser-Busch, Inc. The seven year old power plant, left, is so spectacularly clean and neat that it has constituted a major attraction for professional and technical groups along the eastern seaboard. The popularity of these tours is such that, currently, reservations must be made two months in advance.



(Above) One of the two C-E Type VU-50-S, oil-fired boilers in the Newark brewery (cross-section below). Each has a maximum continuous capacity of 100,000 lb per hr and produces steam at 550 psi and 750 F. The floor in the foreground is chemically cleaned daily, polished twice weekly and completely refinished yearly.



In a brewery, the demands placed upon its boilers can be rigorous indeed. At the Anheuser-Busch brewery in Newark, New Jersey, they provide steam for power generation, for processing and for numerous high-capacity instantaneous water heaters used in various brewing and bottling operations. Since brewing is essentially a "batch" process, steam demands fluctuate sharply and continuously. Yet the C-E Boilers installed at Newark have consistently exceeded performance guarantees and operate at an efficiency of 86%.

Mr. Herman Paradies, Superintendent of Utilities at the Newark brewery, has stated that it is not unusual for steam demands to rise from 80,000 to 130,000 pounds per hour in ten to fifteen seconds, and that the boilers have responded with nominal loss in pressure or temperature. This enviable record, which speaks well both for boiler design and for the skills of the power plant's operating management and staff, is one of which Combustion is proud.

When *you* need boilers, remember that C-E has a complete line of time-tested and service-proved designs and that there is a size and type which will fit your needs and serve you equally well.

COMBUSTION ENGINEERING

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

C-164A

ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

For more facts circle 513 on Reply Card

SILICONE RUBBER INSULATED *BY ROCKBESTOS* OFFER YOU:

Excellent dielectric strength — electrical properties remain constant from −130°F to +500°F.

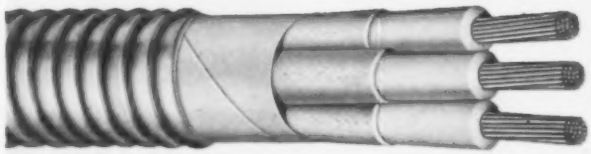
High heat resistance — better than any type rubber insulation. Long service life in temperatures to 125°C (power cables) and 200°C (other applications).

Excellent moisture resistance — unrestricted applications in wet or dry locations — equal to the best grades of rubber. No lead sheath required.

Greater ozone resistance than the best grades of rubber insulated cables.

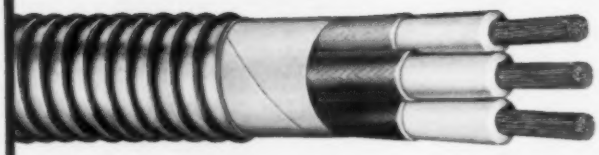
Excellent resistance to chemical attack — being chemically inert, silicone rubber insulations resist effects of lubricating oils and most corrosive atmospheres.

Long life — excellent resistance to weathering and aging.



600 and 5000 VOLT MULTI-CONDUCTOR POWER CABLE

Silicone rubber insulated power cable combined in a 3 or 4 conductor conduit, with interlocked armor overall . . . easily installed with simple supports . . . eliminates conduit . . . greater current carrying capacity for economical power distribution.



MULTI-CONDUCTOR CONTROL CABLE

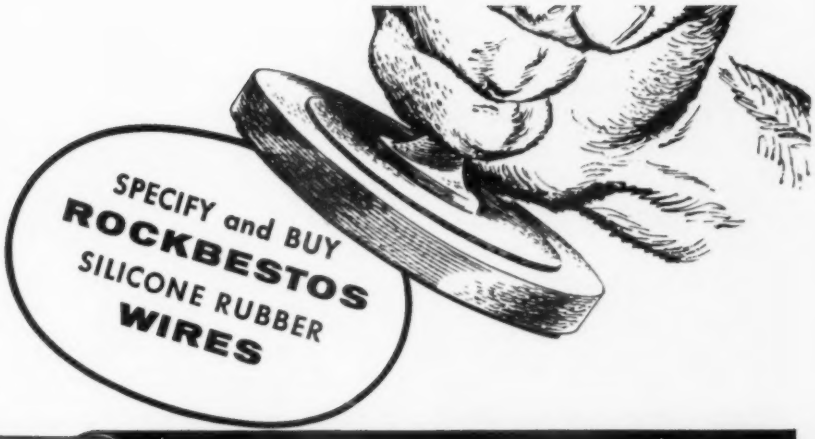
For use in steel mills, power stations, boiler rooms, automotive, ceramic and glass plants as well as other industries where control and signal circuits or control equipment are exposed to high ambient operating temperatures.

ROCKBESTOS PRODUCTS CORPORATION

NEW HAVEN 4, CONNECTICUT

New York • Cleveland • Chicago • Oakland • Los Angeles • Pittsburgh
St. Louis • Detroit • Seattle • Atlanta • Dallas

WIRES



SILICONE RUBBER INSULATED POWER CABLE 600 and 5000 VOLTS

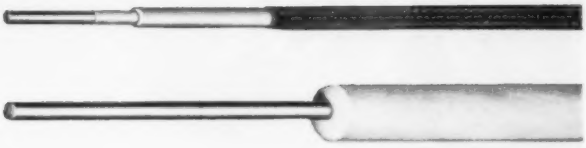
For high temperature circuits either in wet or dry locations, exposed or in conduit. This cable is recommended for use in steel mills, power stations, heat treat areas, boiler rooms, foundries, smelters, etc.

MOTOR LEAD and APPARATUS WIRES

For leads to motors, transformers, etc., requiring a flexible wire in high temperature locations or applications.

APPLIANCE and FIXTURE WIRES

For use in wiring high wattage units when operating temperatures reach 150°C and 200°C. Lighting fixtures, clothes dryers, electronic equipment, stoves, water heaters, ovens, therapeutic devices, space heaters are among the many products for which these wires are recommended.



HEATING CABLES and DEFROSTING WIRES

Heating cables are ideal for use in pipe heating, surface heating, roof de-icing and soil heating.

Defroster wires being odorless and tasteless are perfect for use as rapid defroster heating element in electric refrigerators and freezers.

ROCKBESTOS

For complete details on Rockbestos Silicone Rubber Insulated Wires and Cables send for Catalog SR58.

For more facts circle 514 on Reply Card

STRONGER and SAFER for every high pressure pipeline duty...

...because they are **drop forged by Vogt**

Send for Catalog F-9

Constantly imitated but never duplicated, Vogt drop forged steel fittings and flanges have unmatched strength and toughness for your most severe pipeline duties. Laboratory controlled materials and Vogt's special forging techniques assure products which are always uniform in structure, fine grained, and free from porosity. Thereby the shocks and stresses imposed by high pressures and high temperatures are easily withstood, and with stubborn resistance to erosion and corrosion. Consult Catalog F-9 for our complete line of fittings and flanges.

For a copy of Vogt Catalog F-9 address Dept. 24A-FPLE.

HENRY VOGT MACHINE CO., P.O. BOX 1918, LOUISVILLE 1, KENTUCKY

SALES OFFICES: New York, Chicago, Cleveland, Dallas, Philadelphia, St. Louis, Charleston, W. Va., Cincinnati

OTHER VOGT PRODUCTS

Drop Forged Steel Valves — Petroleum Refinery and Chemical Plant Equipment — Steam Generators — Heat Exchangers — Ice Making and Refrigerating Equipment.

Vogt

DROP FORGED STEEL

Fittings and Flanges

For more facts circle 515 on Reply Card

BULLETINS just released and of immediate plant interest

MATERIALS HANDLING

101 Motor-Driven Cranes—Comprehensive 8-pp Catalog DH-43B describes top running double bridge, motor-driven cranes for all floor-controlled industrial applications. Crane features are detailed and specifications included. Wright Hoist Div., American Chain & Cable Co., Inc.

102 Electric Hoist—Featured in this 12pp bulletin is a coil chain electric hoist designed to bring heavy-duty hoist efficiency and durability to the portable hoist field, while keeping weight to minimum. Component features are shown, and specifications, dimensional data included. Coffing Hoist Div., Duff-Norton Co.

104 For Pneumatic Handling—Three basic pneumatic handling systems for safe, sanitary and speedy moving of dry bulk materials are described in 8-pp Bulletin ER-G-2. Includes block diagrams depicting relationship of equipment components for straight vacuum, straight pressure and combination pull-push pneumatic handling systems. Table of typical materials conveyed is included. Fuller Co.

105 Conveyor Systems—Catalog 6, 74-pp, presents a condensed set of data sheets and illustrations showing applications of several conveyor systems. Among those described are trolley conveyors, belt conveyors, roller conveyors, gravity wheel conveyors, table top chain conveyors, barrel handling conveyors, drum rotators and upenders, pin type and spindle type conveyors, cross-bar conveyors, steel and wood slat conveyors, bulk conveyors, and others. Conveyor Systems, Inc.

106 Material Conveyor — Brochure TV-80 gives general information on company's Tube-Veyor—an enclosed bulk material handling conveyor featuring a two-directional chain to convey in any direction. Includes capacity chart photos and layouts of the conveyors. Prab Conveyors, Inc.

107 Conveyor Belt Carrier—Bulletin 355, 20-pp, features comprehensive technical data, specifications and illustrations on conveyor belt carriers for conveying bulk materials. Dimensional data and diagrams are included. Stephens-Adamson Mfg. Co.

108 Ball Bearing Trolley—Book 2630, 20-pp, on ball bearing trolleys, tells how help maintains efficiency of trolley conveyors. Includes data on types and sizes of trolleys available, selection of new trolleys and attachments, and replacement of units in existing installations. Also gives application and maintenance information, data on trolley wheels, rollers for roller turns and special types of trolleys. Link-Belt Co.

109 Lift Truck Attachments—Mechanical and hydraulic lift truck attachments are listed and described in 50-pp Catalog 585, which illustrates 26 ways of getting more use from their lift trucks—adding efficiency, economy and flexibility to their operations. Photos, drawings, dimensional diagrams included. Little Giant Products, Inc.

110 Tractor Shovel—Bulletin 5255, 20-pp, describes features and advantages of an industrial tractor shovel designed to handle bulk materials more efficiently. Design, construction and maintenance features are fully detailed and component parts shown on cutway. The Yale & Towne Mfg. Co.

111 Industrial Tires—Catalog MR-457, 16-pp, describes versatility and performance of company's solid tires designed for a variety of industrial applications. It includes specifications and performance data as well as preventive maintenance suggestions that will increase normal tire life. The Monarch Rubber Co.

112 Handling Equipment—This 21-pp illustrated booklet describes design and construction features of such steel products as skids, box and skid units, boxes for roll-over and bottom dumping, bar carriers, collapsible boxes, special purpose units (open-end boxes, tote pans and caster-equipped boxes), painted and galvanized boxes, stacking skids, pallets, and drum racks. Photos illustrate uses. Republic Steel Corp.

113 Tote Boxes—Advantages of using tote boxes made of a chemically hardened corrugated board are detailed in this illustrated folder. Photos and descriptions of a variety of boxes and trays are included. Convoy Inc.

114 Material Handling—Sixteen-pp Catalog 90 covers a diversified line of corrugated steel boxes, skids and pallets for unit load handling. Design and application ideas to help speed production and solve specific handling problems are presented. The Union Metal Mfg. Co.

115 Sling Handbook—Form SL-3 is an illustrated 40-pp reference book covering more than 80 subjects on slings and fittings. Included in this revised edition is reference information condensed into handy chart form on sling types, dimensions and rated loads. In addition, section on sling fiittings has been expanded to cover fittings not previously shown, together with reference charts on sizes, rated loads. Union Wire Rope Corp.

116 On Sling Chains — Eight-pp Bulletin DH-39 describes company's complete line of sling chains in one-to-four-leg styles with sling hooks, sling grab hooks, and foundry type hooks. Contains comprehensive data on selecting proper chain size for individual requirements; working load limits for various leg styles and angles; basic components to assemble in a sling chain; and information on assembly and repair. American Chain Div., American Chain & Cable Co., Inc.

VALVES, PIPING, FITTINGS

117 Water Control Valves — Nine automatic water control valves and their uses are described in 8-pp Bulletin G-5A. Covered are cushioned check valves, water level control valves, sensitive pressurized regulators and one-man control valves. Golden-Anderson Valve Specialty Co.

118 Solenoid Valves—Eight-pp Factory Stock List No. 505 contains prices, valve ratings, flow diagrams, illustrations and engineering data on solenoid valves. Sufficient ordering information is provided. Automatic Switch Co.

119 Gate Valves—Catalog Section A features a line of leakproof gate valves incorporating a double sealing action. A cutaway view showing engineering features is included, as well as tabulated dimensional data, diagrams, and installation and operation instructions. Hamer Valves, Inc.

120 Lined Clay Pipe—Described in this illustrated brochure is a glass lined sewer pipe with built-in advantages. Performance and installation details are illustrated and described. American Vitrified Products Co.

121 Loading Assemblies—Catalog F-32R, 24 pp, describes loading assemblies and accessory products. Contains detailed product descriptions and photos, engineering information, dimensional drawings, installation layouts and selection instructions. Jordan Industrial Sales Div., OPW Corp.

Reader Service Cards for ordering bulletins are on pages 171-172. Be sure to include your name, job title, and company, even if you want bulletins mailed to your home address.

122 Guide to Couplings—This 26-pp general catalog describes company's quick-connect, quick-disconnect couplings, including a coupling for high pressure applications, for impact in air lines, for low pressure applications, for vacuum and very low pressures, and for hard to handle fluids. Illustrates construction details through cutaway drawings. Snap-Tite, Inc.

123 For Piping Flexibility—Eight-pp Bulletin 28A illustrates applications of swing joints, flexible ball joints, and flexible strut joints, especially for petrochemical plants, oil refineries, and the petroleum industry. Photos and diagrams illustrate solutions to problems regarding the handling of thermal expansion in permanent piping installations, loading lines. Barco Mfg. Co.

MECHANICAL POWER TRANSMISSION

124 On Drive Selection—Steps in selecting a heavy duty V-belt drive are outlined in 16-pp Bulletin DH-301. Service factor table, design horsepower table, minimum installation allowance table and complete selection tables are included. The Gates Rubber Co.

BULLETINS

(Begins on page 21)

125 Variable Speed Control—Eight-pp Bulletin F-1882 describes operation and application of Varitrol variable speed drive and pneumatic control systems. Typical applications are illustrated and advantages detailed. U. S. Electrical Motors Inc.

ELECTRICAL

126 Weather Protected Motors—Bulletin GEA-6721 describes company's weather-protected motors available from 250 hp and up for both indoor and outdoor operation. Main features and advantages are illustrated and described. General Electric Co.

127 Enclosed Short Motors — Bulletin 2100 describes enclosed pancake motors intended for use on machine tools, roof-ventilating fans and other space-cramped applications. Cutaway view showing construction features is included. The Louis Allis Co.

128 Secondary Substations—A comprehensive description of secondary unit substations from simple radial systems to secondary selective systems is contained in 20-pp Bulletin 18B6285C. Includes an incoming line section with tabulated data, a transformer section with ratings table, a distribution feeder section, space requirements of secondary unit substations, and application section. Allis-Chalmers Mfg. Co.

129 Transformer Guide — Bulletin GEC-1600, 20 pp, is a quick guide for specifying and ordering dry-type transformers for commercial and industrial applications. Transformer types are shown in a pictorial index which also lists applications and gives a basic description. General Electric Co.

130 Heavy Duty Systems—Features and applications of heavy duty Feedrail for powering cranes, hoists or other moving equipment are detailed in 28-pp Bulletin 70. Includes data on track sections, track accessories, trolleys, rainshields, typical installations, planning an installation, mounting methods—dimensions, photos of installation procedure. Feedrail Corp.

131 Service Entrance Cable — This 8-pp booklet gives availabilities, technical data, material economies and advantages of aluminum service entrance cable. Chart furnishes pertinent cable construction details, dimensions, weights, and current carrying capacities. Typical uses covered. Kaiser Aluminum & Chemical Sales, Inc.

132 For Wiring Installation — Sectionalized Catalog 158 covers company's line of wiring installation equipment, including Section 158-A on conventional wireways, fittings and lay-in ducts, as well as flanged hinged-latched-cover wireways, fittings and wiring troughs. Section 158-B is devoted to cutout and pull boxes, control panel enclosures, terminal and pull boxes, oil-tight pushbutton enclosures, others; and Section 158-C lists outlet boxes and switch boxes. Each section contains dimensional specifications and comparative data. Keystone Mfg .Co.

133 Improved Conductor—Applications and advantages of all-aluminum alloy conductors for distribution systems are detailed in this 8-pp brochure. Selection charts are included. Kaiser Aluminum & Chemical Sales, Inc.

134 Metal Raceways — Pocket-Size Catalog and Wiring Guide 21, 144 pp, covers surface metal raceways and fittings, multi-outlet systems, fluorescent and slimline lighting equipment, and non-metallic flexible conduit, with detailed installation instructions. Catalog lists fittings, covers fastening methods, wiring for spotlights, graphical electrical symbols, and provides illustrations of various types of installations. The Wiremold Co.

135 Capacitor Equipments—Bulletin GEA-6796, 8 pp, describes aluminum stack racks designed to supply bulk kilovars on transmission, subtransmission and distribution circuits. Provides detailed information on selection, application, installation and protection of stack rack capacitor equipments. Includes charts, dimensional drawings and tables on ratings and weights, performance. General Electric Co.

136 Storage Batteries—Bulletin 210, 24 pp, is a detailed technical manual on use of stationary storage batteries. Contains reports on effect of temperature on battery capacity and provides tabulated data and general information on selection of batteries and charging equipment, battery and charger maintenance, selection of battery racks, determination of discharge ratings. Exide Industrial Div., The Electric Storage Battery Co.

137 Power Package — Bulletin AR-101/58 describes operation of company's combination power package of silicon charger and long-life lead-calcium plate batteries. Explains performance of both charger and battery, and includes curves and diagrams illustrating discharge and charging characteristics. C & D Batteries, Inc.

138 Butyl Rubber Insulation—Contained in this 28-pp illustrated book is an analysis of the chemical structure of butyl insulation. Charts and technical listings in table form provide data on electrical qualities, heat serviceability, temperature resistance and aging properties. Details of cable construction, typical types of butyl insulated cable, facts on shielding given. National Electric Products Corp.

LIGHTING

139 Lighting Maintenance Tips — Principles and advantages of good lighting practice are presented in this 48-pp lighting maintenance manual. Much useful information has been added to this revised edition, including a guide to trouble shooting fluorescent installations, a section on planning group replacement of lamps, and a section on planning a program for cleaning lamps. Champion Lamp Works.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 171-172.

140 Lighting Handbook — This pocket catalog describes over 5000 lighting fixtures, including fluorescent, incandescent, mercury-vapor, protected-incandescent, floodlighting, fittings and lampholders, and audible signal equipment. In addition to specifications and dimensions, catalog has complete engineering data, footcandle values, coefficients of utilization, photos, sketches. Benjamin Electric Mfg. Co.

TOOLS, WELDING AND MACHINE SHOP EQUIPMENT

141 Industrial Tools — Pocket-size catalog 85, 48 pp, provides illustrations and specifications of all of manufacturer's portable electric and air tools. These include balancers, bench grinders, drills, generators, grinders, hammers, impact wrenches, nibblers, nut setters, polishers, sanders, saws, scalers, screwdrivers, valve seat grinders, others. Booklet includes application suggestions. Thor Power Tool Co.

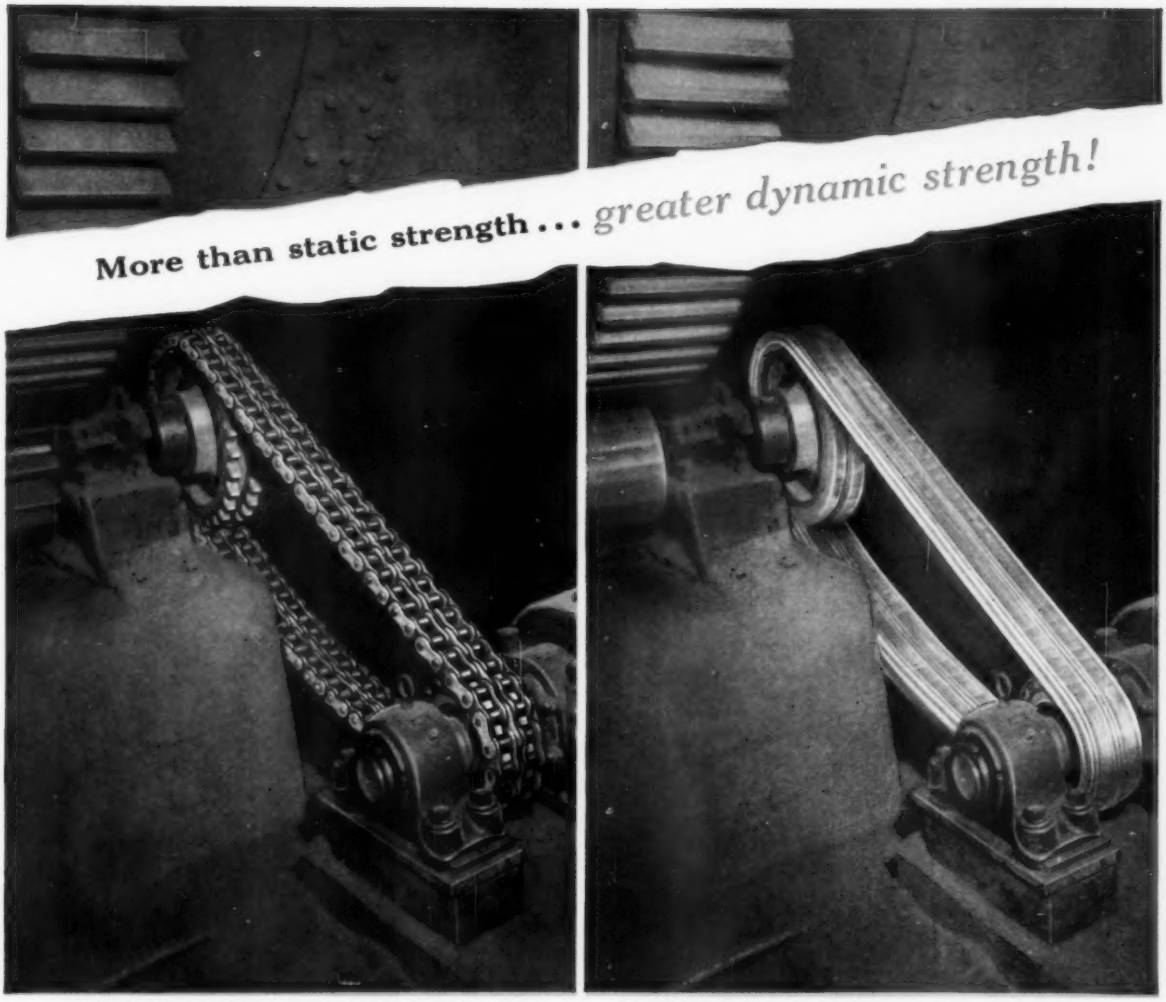
142 On Titanium Welding—Sixth in this company's series of engineering bulletins is this 32-pp booklet on titanium welding techniques. Outlines do's and don'ts for successful welding, and covers fusion-welding and resistance-welding equipment and procedures, typical weldments, and methods for evaluating weld quality. Generously illustrated, booklet also treats welded joint designs, mechanical properties of weldable grades of titanium. Titanium Metals Corp. of America.

143 Welding Gun—Applications and advantages of a portable hand gun, West-Ing-Gun, that drives its own self-contained supply of welding wire are detailed in two recently published bulletins. One features a general description of the tool and the other, Descriptive Bulletin 26-523, describes operation of the hand gun and control monitor. Westinghouse Electric Corp.

144 Welding Wire—Answers to almost every question that can be asked about welding wire for use with company's gas-shielded metal arc—or Aircomatic—welding process are presented in pocket-size 84-pp Catalog 2330. Describes varieties of wire types, wire diameters, and packaging data, and contains technical information such as chemical composition, mechanical properties. Typical uses covered. Kaiser Aluminum & Chemical Sales, Inc.

145 Machine Tool Guide—Eighty-pp Catalog 5800 presents this manufacturer's line of precision machine tools. Equipment shown includes engine lathes, toolroom lathes, turret lathes, vertical spindle milling machines, bench shapers, drill presses and pedestal tool grinders. Attachments, tools, chucks and accessories are also listed. Specifications provided include capacities, weights. South Bend Lathe Works.

(More Bulletins on page 173)



More than static strength . . . *greater dynamic strength!*

RESISTANCE TO TENSILE STRESS is achieved with properly heat-treated, accurately machined side bars made of premium steel and fitted with properly hardened pins, bushings, rollers.

STRENGTH OF CHAIN IN MOTION results from such refinements as pitch-hole preparation, micro-finish of parts, special processing of side bars, pre-lubrication, rigid quality control from materials selection to final boxing.

Big reason for the extra life from LINK-BELT roller chain

STARTING shock, heavy loads and impact of sprocket engagement on modern heavy-duty machinery requires a chain that will resist fatigue. That's why Link-Belt gives you *greater dynamic strength* to shrug off stresses. Pre-stressing, closer heat-treat control, lock-type bushings, shot-peened rollers—all these Link-Belt refinements contribute extra stamina for extra life . . . provide smoother, more efficient chain performance . . . reduce drive and conveying costs.

You have a choice of single- or double-pitch, single- or multiple-width chain. See your Link-Belt office or authorized stock-carrying distributor for facts.

LINK-BELT

ROLLER CHAIN & SPROCKETS

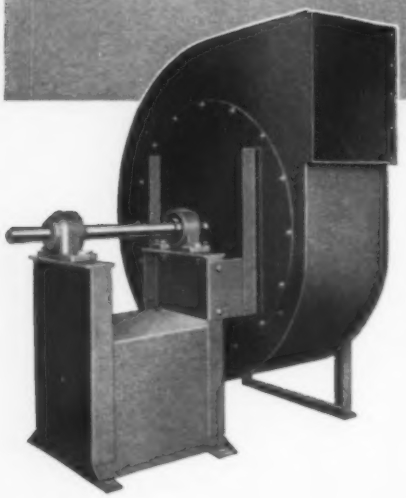
14,644

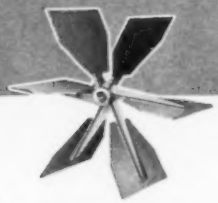
LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville (Sydney), N.S.W.; South Africa, Springs. Representatives Throughout the World.

For more facts circle 516 on Reply Card

FAST ACTION DELIVERY

Clarage Industrial Air and Material Handling Fans





TYPE XL FANS. Distinguished by advanced design, high efficiency. Universal discharge, 3 different interchangeable wheel types available, reversible for either clockwise or counter-clockwise rotation with rim or open type wheels. Rugged, tight, fabricated steel construction. Pressures to 18" SP. **IMMEDIATE SHIPMENT** on all standard Arrangement 1 and 9 fans. Arrangement 4 and 8 fans also promptly available.

TYPE CI FANS. Proved performers in a wide range of services. Cast iron construction. Universal discharge, 2 different interchangeable wheel types available, reversible for either clockwise or counter-clockwise rotation. 6 sizes, pressures to 24" SP. **IMMEDIATE SHIPMENT** on all standard Arrangement 1 and 2 fans. Arrangement 4 and 8 fans also promptly available.

CALL TODAY the nearest Clarage sales engineering office:

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ALBUQUERQUE, N. M.
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CLARAGE FAN COMPANY Kalamazoo, Mich.

CLARAGE

...dependable equipment for making air your servant

SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES • IN CANADA: Canada Fans, Ltd., 4285 Richelieu St., Montreal

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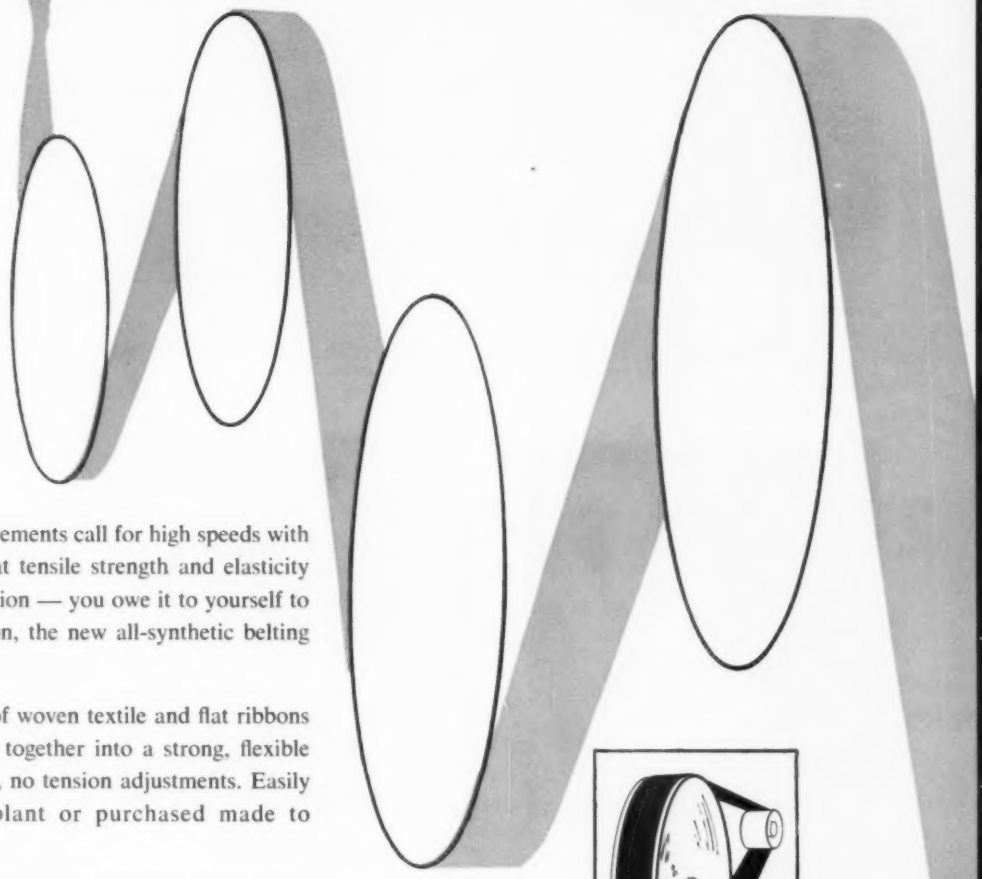
® Texalon

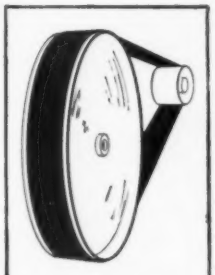
laps easily in minutes . . . operates smoothly at speeds up to 10,000 FPM



If your flat-belt drive requirements call for high speeds with high-pulley ratios . . . great tensile strength and elasticity . . . high co-efficient of friction — you owe it to yourself to investigate Rhoads' Texalon, the new all-synthetic belting for modern drives.

Texalon is a combination of woven textile and flat ribbons of extruded nylon, welded together into a strong, flexible belting. No belt shortening, no tension adjustments. Easily made endless in your plant or purchased made to specification.

At Rhoads, an experienced belt-drive engineer recommends the flat belt that is exactly right for your operating conditions. It may be Tannate leather belting, the product of 256 years of tanning experience. It may be Tanastic, new leather/plastic belting with a stretch-free nylon core. Or it may be Texalon — for facts on Texalon write for new 6-page data folder and sample. Address Engineering Department, J. E. Rhoads & Sons, Wilmington 99, Delaware.



In nearly every application, when all factors are considered, the most economical means of Power Transmission is the Belt Drive.

RHOADS

Since 1702 . . . Pioneers in Mechanical Power Transmission

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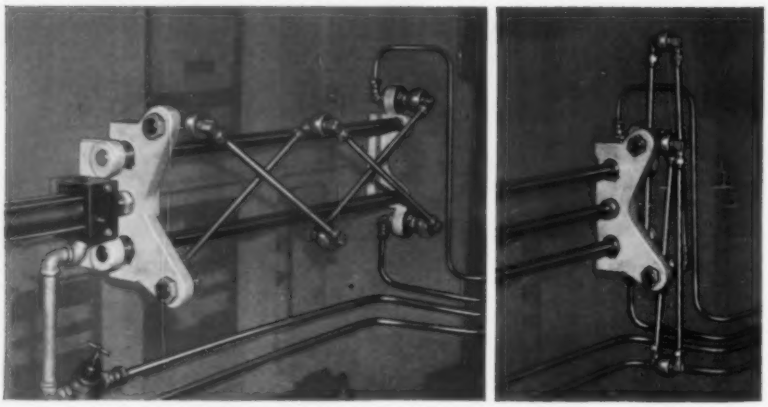
IN EQUIPMENT DESIGN ■

CHIKSAN SWIVEL JOINTS

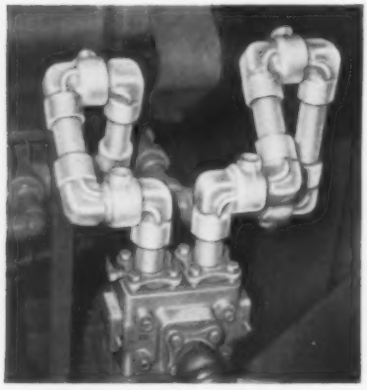
SMOOTH OUT KNOTTY LINE PROBLEMS



STEEL LINES FOLD LIKE AN ACCORDION

Connected to a moving head, these compact swivel jointed all-metal hydraulic lines flex and fold like an accordion on this automatic bottle unpacking machine.

When a machine's moving parts cause tight bend or twist on hose lines, Chiksan Swivel Joints provide a ready solution. When design dictates the use of metal lines, Chiksan Swivel Joints allow rubber-like flexibility. In fact, wherever line flexibility is required, designers and maintenance engineers know it's just good business to call on Chiksan. Precision made Chiksan Swivel Joints with their infinite service life, full 360° rotation and high safety factor, quickly pay for themselves by minimizing hose replacement and eliminating costly line failure, fluid loss and downtime. If your equipment hose lines require frequent replacement due to torsion or bend radii fatigue, or if flexible all metal lines are in order, contact Chiksan. A nearby representative will call, analyze your requirements, and make specific recommendations. Write today for his name.

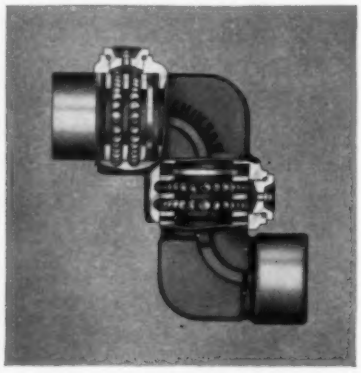


NO HOSE BURST HERE

These Chiksan swivel jointed steel lines on a die casting machine eliminate damaging hose ruptures, reduce fire hazard, fluid loss and setup time by 75%.

NO BEND FATIGUE HERE

This highly specialized lens grinder utilizes Chiksan Swivel Joints to eliminate tight hose bend as the multiposition head is shifted from one grinding position to another.



LOOK INSIDE A SWIVEL JOINT

Detailed attention to detail. Precision machining and specific packing seals for specific services. These are the quality-plus features built into every Chiksan Swivel Joint.

CHIKSAN

fmc A SUBSIDIARY OF FOOD MACHINERY AND CHEMICAL CORPORATION

CHIKSAN COMPANY–BREA, CALIFORNIA • CHICAGO 5, ILLINOIS • NEWARK 2, NEW JERSEY

Well Equipment Mfg. Corp. (Division), Houston 1, Texas • Subsidiaries: Chiksan Export Company • Chiksan of Canada, Ltd.

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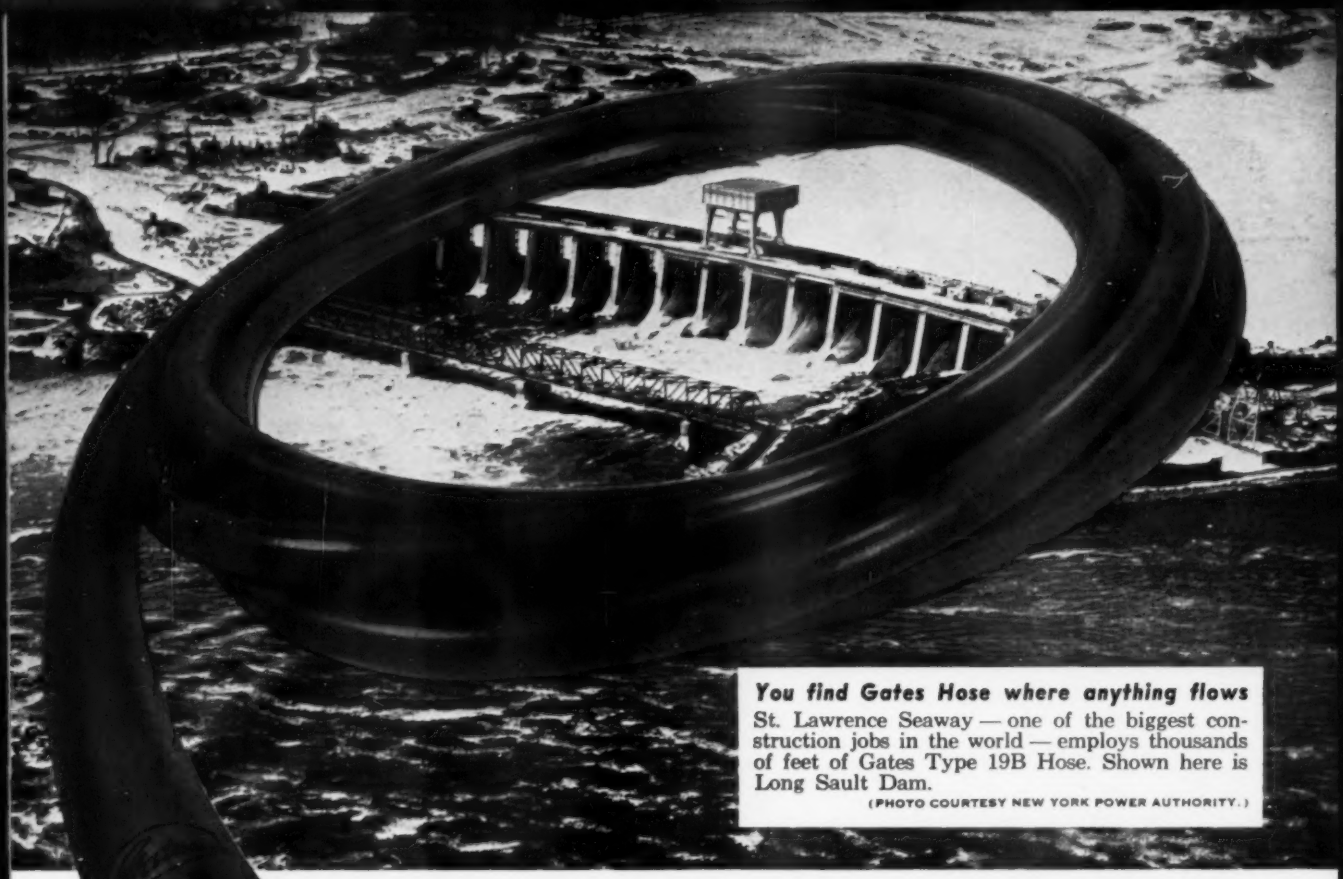


You find Gates Hose where anything flows

St. Lawrence Seaway — one of the biggest construction jobs in the world — employs thousands of feet of Gates Type 19B Hose. Shown here is Long Sault Dam.

(PHOTO COURTESY NEW YORK POWER AUTHORITY.)

Industry has in use today more than 4000 MILES of *Type 19B** Gates Hose

...and industry all over the world uses equally impressive amounts of the air, water, steam, suction and many other hoses in the full range of types and sizes made by Gates.

Back of this world-wide acceptance is a continuing program of *specialized* hose research at the multi-million dollar Gates Research Center staffed by more than 200 chemists, physicists, engineers and technicians.

It is the aim of this *specialized* research to increase hose utility and life, and to lower industry's annual hose costs.

Because Gates Hose is so widely preferred, it is quickly available from leading distributors in all industrial centers in the United States, and in 90 countries throughout the world...and its outstanding performance is guaranteed by the **World's Largest Maker of V-Belts.**

***Gates Type 19B Hose** carries air, water, coolants, oils, greases, gasoline, kerosene, or solvents. This popular hose—one of many in Gates full line—is always available from your nearby Gates Distributor.

e Mark of Specialized Research

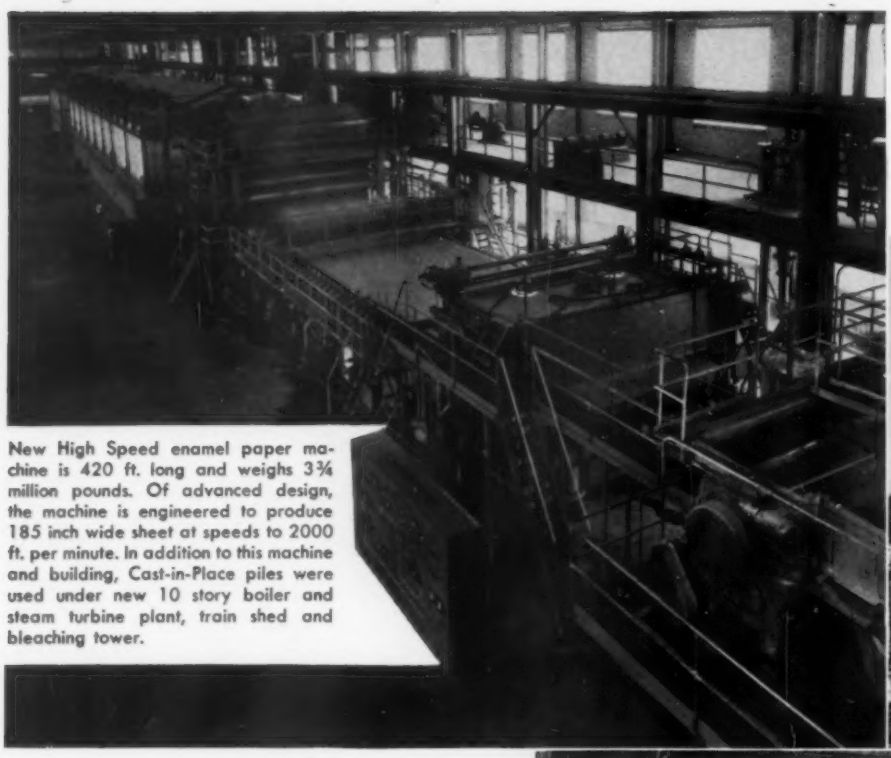
Gates

The Gates Rubber Company • Denver, Colorado

TPA 335

Gates Industrial Hose

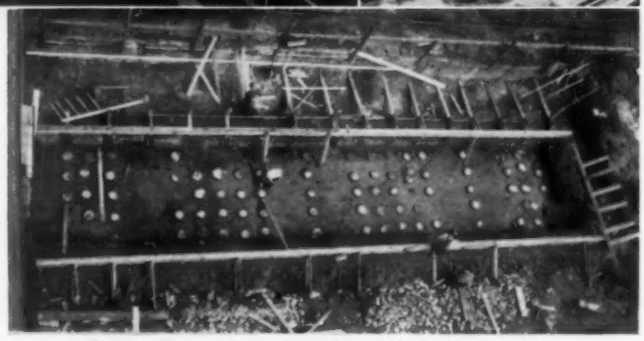
Made in a Full Range of Types and Sizes



New High Speed enamel paper machine is 420 ft. long and weighs 3¾ million pounds. Of advanced design, the machine is engineered to produce 185 inch wide sheet at speeds to 2000 ft. per minute. In addition to this machine and building, Cast-in-Place piles were used under new 10 story boiler and steam turbine plant, train shed and bleaching tower.

Cast-in-Place rig places pile close to existing building without danger of vibration damage.

paper production boosted on Cast-in-Place piles



Cast-in-Place pile pattern for section of new plant.
(Photos—courtesy Consolidated Water Power & Paper Co.)

In planning new buildings for a 15 million dollar expansion program, Consolidated Water Power & Paper Company was confronted with difficult soil conditions at their Biron, Wisconsin, plant.

Borings indicated the existence of a non-uniform sand, clay, and decomposed granite soil underlain by granite bedrock at irregular depths. A further complication was the periodic rise and fall of the nearby river, causing a fluctuating water table and consequent movement or loss of fines in some areas. Under these conditions, it was considered inadvisable to depend on spread footings for buildings or high-load machine foundations. It was recommended that all loads be transferred directly to bedrock through the use of economical Cast-in-Place INTRUSION mortar piles.

INTRUSION-PREPAKT Cast-in-Place piles offered advantages not obtainable with any other type. Highly mobile equipment permitted operations close to existing buildings without danger of vibration or ground heaving usually associated with driven piling. In areas where soil was not self-supporting, casing was unnecessary because INTRUSION mortar under pressure fills hole as auger is withdrawn. This pressure also provided some lateral penetration to stabilize weak soil zones and increase pile skin friction. In all, some 1300 high-strength Cast-in-Place piles were placed for Consolidated's expansion program that added 230,000 square feet of floor space.

Cast-in-Place piles have a proven record of success all over the world. In addition to foundations, they provide a practical solution to many shoring, underpinning, stabilization and cofferdam problems. For more information on Cast-in-Place piles and other I-P construction services, contact: INTRUSION-PREPAKT, INC., 568-M Union Commerce Bldg., Cleveland 14, Ohio. In Canada, INTRUSION-PREPAKT, LTD., 159 Bay Street, Toronto, Ontario.

INTRUSION-PREPAKT, INC.

OFFICES IN PRINCIPAL U. S. AND FOREIGN CITIES

*Intrusion and Prepakt are trade marks of Intrusion-Prepakt, Inc., whose methods and materials are covered by U. S. Patents Nos. 2313110, 2655004, 2434302 and others, also patents pending.

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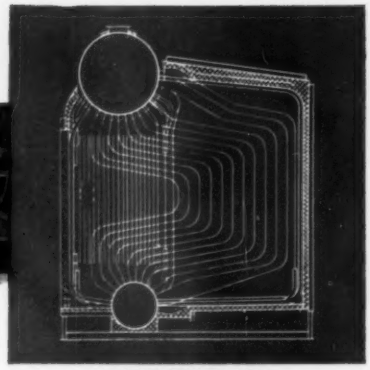
HIGH CAPACITY PACKAGED STEAM GENERATORS

by Foster Wheeler

One of two AG-246 units, each capable of generating 50,000 lb/hr sold to C. F. Braun & Co. of Canada Ltd. for installation at the new Cities Service Oil Co. Ltd. at Trafalgar, Ontario



Series AG-200 extends economy and dependability of FW Packaged Design to over 60,000 lb/hr

To meet the needs of industrial plants for high-capacity Packaged Steam Generators, Foster Wheeler offers units for capacities of 50,000 to 63,000 lb/hr and higher, depending on operating conditions.

A modification of the proven AG-100 design which has provided industry with reliable, economical steam in the range of 10,000 to 50,000 lb/hr, these compact, space-saving units permit more steam capacity in less space than has heretofore been possible. For complete details, write to *Foster Wheeler Corporation, 666 Fifth Avenue, New York 19, N. Y.*

FEATURES:

- Final Steam Temperatures to 840 F
- Design Pressures to 900 psig
- Standard Heat Recovery Arrangements Available
- 42-inch Steam Drum
- Two Burners
- Automatic Controls
- Suitable For Indoor or Outdoor Installation
- Tangent Bare Tube Furnace Side Walls and Roof
- Staggered Boiler Bank Tube Arrangement
- Fully Drainable and Removable Superheater.

THE FOLLOWING AG-200 UNITS ARE NOW IN PRODUCTION:

Capacity lb/hr	Operating Pressure psig	Final Steam Temperature Deg. F	Feedwater Temperature Deg. F	Fuel	Efficiency	Steam Quality
52,500	400	750	200	No. 6 Oil	85.5	3 ppm Solids Carryover
60,000	285	Sat.	220	Nat. Gas	78.3	3 ppm Solids Carryover
63,700	150	Sat.	225	No. 6 Oil	83.7	0.5% Moisture Carryover
68,000	620	Sat.	350	No. 6 Oil	80.9	1 ppm Solids Carryover

FOSTER WHEELER

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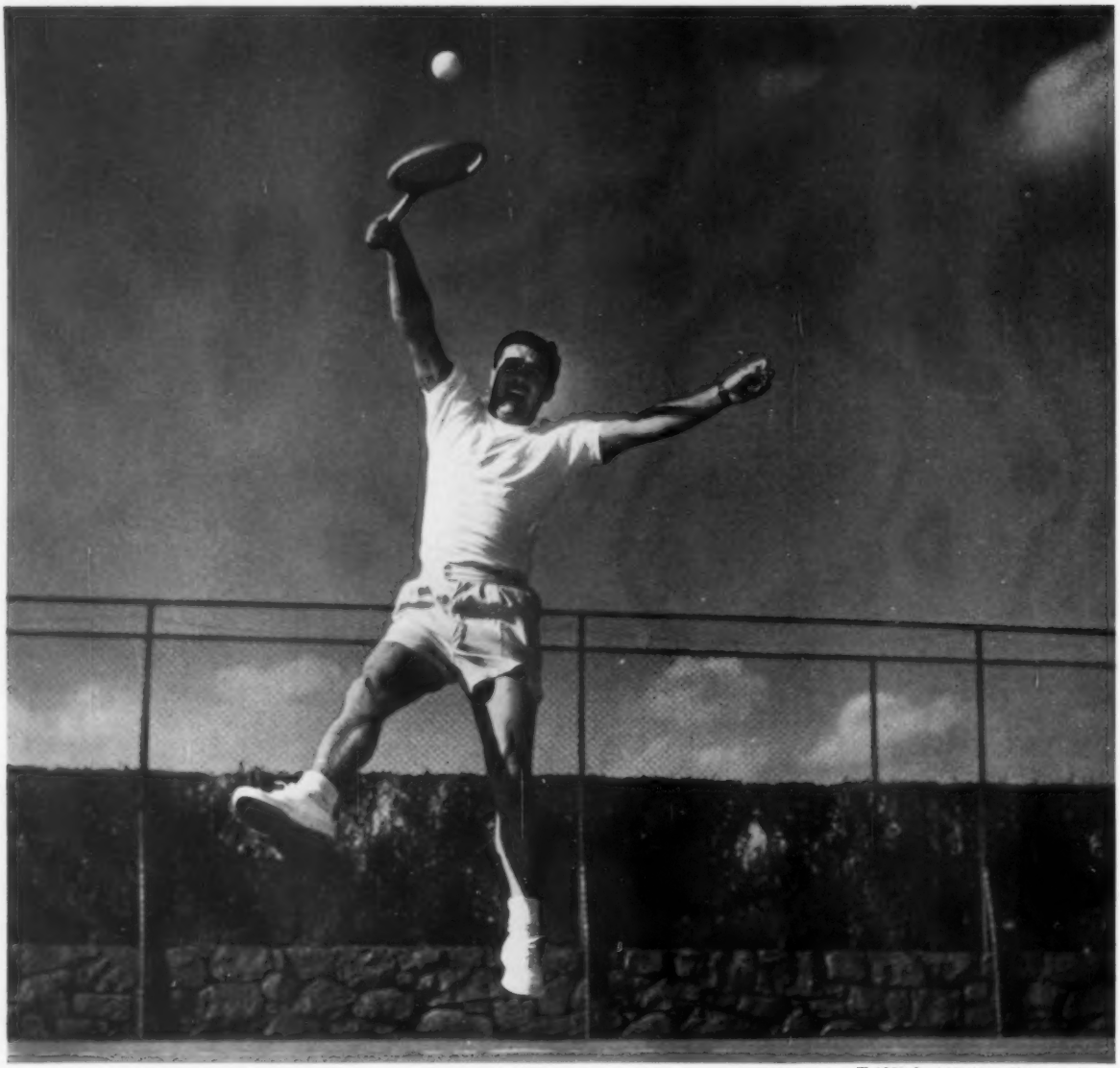

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SMASHING *all records for long battery life...* **gould**

Gould Industrial Truck Battery—America's Finest

You want the most for every dollar invested in batteries. Gould can help you.

Batteries get harder use some days, lighter use other days. Operating conditions are seldom constant. Frequent over-discharging and over-charging, which is not recognized and corrected, can seriously harm a battery.

You can avoid this possibility. Assure maximum operating efficiency, lower maintenance costs, and longer battery life, by letting Gould help you establish a simple effective preventive maintenance program for your batteries.

Can't you see how you will benefit from such a program? Call your local Gould representative for details. No obligation. He's listed under "Batteries, Industrial" in the yellow pages. Gould-National Batteries, Inc., Trenton 7, N. J.

Always Use Gould-National Automobile and Truck Batteries

More Power to you from Gould

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NEW!

N-PBM
Jib Master
BY
Borg-Warner®
INDUSTRIAL CRANES

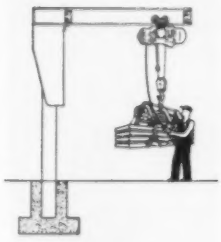
The Borg-Warner slogan, "Design it better . . . Make it better", has been followed to the letter in the new Jib Master! Here is a quality-constructed jib crane specifically designed to meet the needs of most industrial plants.

Entirely self-supported, Jib Master swings through a full 360° for efficient materials handling over a large area. All structural and mechanical parts are designed and tested to withstand rated loads with a generous safety factor built in.

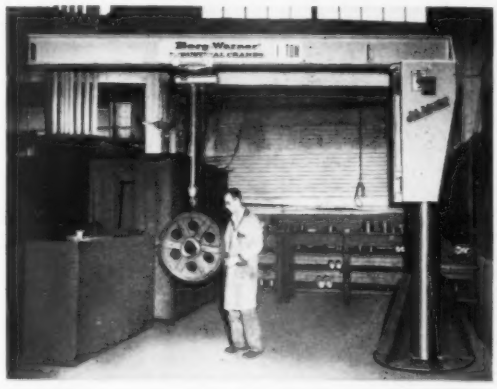
A comparison of Jib Master features demonstrates the rugged construction and the ability of this crane to provide fast, efficient and safe load handling for years of trouble-free service. Write today for full details or call your local B-W Industrial Cranes distributor.

Jib Master gives you all these quality features:

1. Head assembly pivots on heavy-duty tapered-roller thrust bearing.
2. Head assembly accurately positioned and welded for perfect alignment of jib. Heavy side plates.
3. Two large-diameter, carefully machined side rollers. Each roller has two precision ball bearings for smooth, easy jib rotation.
4. Heavy wall seamless steel column.
5. Heavy circular base plate, 6 large gussets and column are welded to form a rigid frame.



The Jib Master is also available in Pillar Foundation Mounted type, designated N-PFM. Either Jib Master model can be used with chain block or electric hoist.



Industrial Cranes — Ingersoll Products — B-W — Borg-Warner

Design it better . . .
Make it better.

Find Your Nearest Distributor Under CRANES In The Yellow Pages

Distributors in all principal industrial cities.

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1590 S. PAULINA STREET, CHICAGO 8, ILLINOIS
Export Sales: Borg-Warner International, 36 South Wabash Ave., Chicago 3, Illinois

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"THIS LUBRICANT ENABLED US TO INCREASE PRODUCTION"

says—PITTSBURGH TUBE COMPANY

"Our 70,000 pound Draw Bench was designed to operate at a maximum of 80 feet per minute, full load. We decided to increase the drawing speed on lighter tubing to 100 and 104 feet per minute. This overloaded the Speed Reducer, however, causing it to overheat. We tried four different makes of oils without success before trying LUBRIPLATE A.P.G. 90. With LUBRIPLATE, we are able to pull heavier tubing than before at 104 feet per minute without the Reducer overheating."

R. S. Vorous
Maintenance Engineer

REGARDLESS OF THE SIZE AND TYPE OF YOUR MACHINERY, LUBRIPLATE GREASE AND FLUID TYPE LUBRICANTS WILL IMPROVE ITS OPERATION AND REDUCE MAINTENANCE COSTS.

LUBRIPLATE is available in grease and fluid densities for every purpose . . . LUBRIPLATE H. D. S. MOTOR OIL meets today's exacting requirements for gasoline and diesel engines.

For nearest LUBRIPLATE distributor see Classified Telephone Directory. Send for free "LUBRIPLATE DATA BOOK" . . . a valuable treatise on lubrication. Write LUBRIPLATE DIVISION, Fiske Brothers Refining Co., Newark 5, N. J. or Toledo 5, Ohio.

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BACKTALK AND FORETHOUGHTS

Edited by Marjorie E. Weissman

Request from Uncle Sam

PLANT ENGINEERING:

"We should very much appreciate your permission to use the following article from PLANT ENGINEERING, as well as the loan of seven glossy prints to illustrate it, in the Technical Digest. The article is 'Machine-to-Machine Parts Handling' appearing on pages 88, 89, 90 and 91 of the April, 1958 issue." *Helen P. Parker, Technical Digest Service, U. S. Department of Commerce, Office of Technical Services, Washington 25, D. C.*

Centrifugal Pumps Series

PLANT ENGINEERING:

"Our engineering department is most interested in receiving a copy of your article by E. Schwandt, dated August 1957, pages 114-5, entitled 'Centrifugal Pumps—Correct Installation and Starting Give Them Good Lease on Life.'

"If there is a charge for this article we will be glad to mail our check promptly upon receipt of your advice." *Esta F. Frayman, Librarian, Taco Heaters, Inc., Cranston, R. I.*

► The article requested by this correspondent is one of a series of three which appeared in our August and October, 1957 and April, 1958, issues. We have forwarded the complete series with our compliments.—*Editors.*

Will Submersible Pump Solve This Problem?

PLANT ENGINEERING:

"I read with a great deal of interest, the article on pages 126 and 127 in the April edition of PLANT ENGINEERING magazine.

"If I understand the article correctly, this pump with its integrally connected electric motor is completely submerged in water, as well as the electric supply cable.

"As we are now engaged in overhauling eight deep well pumps and are also planning two new well installations of approximately 1000 gpm capacity from wells from 150 ft to 200 ft deep, I would like to get more information on these pumps.

"Our present pumps are vertical turbine type with enclosed shafting and bearings. The bearings are oil lubricated and over a period of 25 years, considerable oil has accumulated in the wells on top of water surface. We have had to renew several pumps with its related bearings and some of the shafting.

"This submerged pump seems to me a much better arrangement and I would appreciate it if you could give me more information on this subject.

"We'd like to have this information in order to make recommendations if it seems practical for our situation." *George T. Hoover, Chief Engineer, Pilgrim State Hospital, West Brentwood, Long Island, N. Y.*

► Mr. Hoover does understand the article correctly and we have passed a copy of his letter along to the manufacturer of the pump mentioned in the article, the Byron-Jackson Division, Borg-Warner Corporation, Los Angeles, Calif.—*Editors.*

Making Color Work

PLANT ENGINEERING:

"In the December, 1957, issue of PLANT ENGINEERING, there is an article on page 126 by Burke W. Wombacher, Plant Engineering Consultant, California, titled 'Putting Color To Work.' We would like to receive tear sheets of this article." *Charles W. Freeberg, Plant Engineering, Sundstrand Aviation, Rockford, Ill.*

Fluid Power Maintenance

PLANT ENGINEERING:

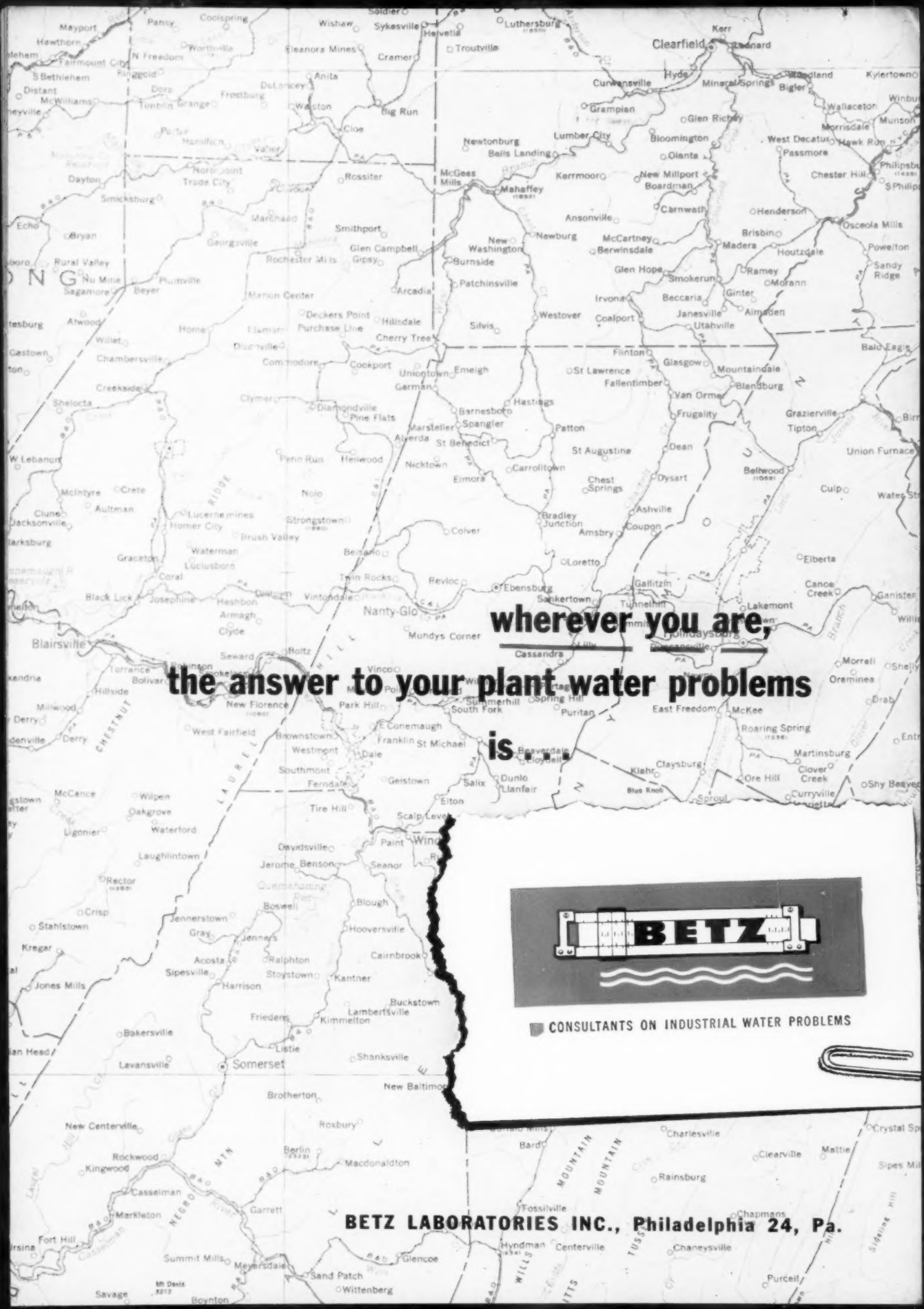
"For the enclosed dollar, we would be pleased to receive a copy of the booklet on fluid power maintenance as described in the February, 1958, issue of your magazine." *J. H. Wegerif, Engineering Dept., MacMillan & Bloedel Ltd., Harmac Pulp Div., Nanaimo, British Columbia, Canada.*

► These 48-page booklets deal with the installation and maintenance of both hydraulic and pneumatic systems and include the J.I.C. standard symbols for hydraulic and pneumatic industrial equipment. Price is $1.00 per copy.—*Editors.*

Reprints of Construction Briefs

PLANT ENGINEERING:

"I have recently been given three Construction Briefs which were reprinted from six-article series appearing in your publication during the periods July 1953 to May 1954; July 1954 to May 1955; and August 1955 to August 1956. Because these were


wherever you are,
the answer to your plant water problems
is . . .
BETZ
CONSULTANTS ON INDUSTRIAL WATER PROBLEMS
BETZ LABORATORIES INC., Philadelphia 24, Pa.

EXPANSION JOINTS FOR VOLATILES AND GASES

Flexible metal hose, for leak-proof security, inherent static protection. Specially designed Titepak flange for holding high pressures for interlocked type of tubing. Pressures to 200 PSI. 2" to 24" I.D. in galvanized steel, stainless steel and bronze . . . with asbestos or special packing lined pressure carrier. Write for booklet to Pennsylvania Flexible Metallic Tubing Company, Inc., 7214 Powers Lane, Phila. 42.

GET YOUR COPY

PENFLEX

TIGHT AS A PIPE BUT...

FLEXIBLE

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BACKTALK— FORETHOUGHTS

found to be concise and informative, I would like to know if you have any other reprints available concerning similar or other phases of plant engineering fundamentals and, if so, how they may be obtained." *R. E. Clark, Lamp Glass Dept., General Electric Co., Cleveland, Ohio.*

► The first booklet in the Construction Briefs series deals with: Beams, Reactions, Bending Moment, Shear, Moment of Inertia, Section Modulus; the second covers: Deflection, Horizontal Shear, Practical Applications, Floor Loading, Framing—Columns; and the third covers: Columns, Trusses, Connections, Welded Connections. The fourth booklet available in the series includes articles published in PLANT ENGINEERING between October 1956 and October 1957 and is concerned with: Fastenings for Timber, and Parts I, II, III and IV of the series "Structural Design of an Industrial Building." These booklets are available at 50 cents each.—*Editors.*

Boiler Deposit Article

PLANT ENGINEERING:

"Will you please inform us as to the availability of a reprint of 'Boiler Deposits—Why They Cost You Money, Efficiency and Tubes' by J. S. Beecher, E. F. Drew & Co., in the January, 1958, issue of PLANT ENGINEERING." *L. A. Crenshaw, Technical Services, Texas City Refining, Inc., Texas City, Texas.*

► Tear sheets of this article are still available to our readers who are interested in obtaining copies.—*Editors.*

Wood Preserving Paints

PLANT ENGINEERING:

"In the March, 1958 issue of PLANT ENGINEERING you had an excellent article on 'Plastic Paints—Where They Can Be Used, How To Prepare Surface and How They Are Applied.'

"My particular interest was in regard to these paints on outside wood surfaces where mildew is a particularly tough problem in this rather humid climate. Although I judged that they would be a suitable solution to the problem, comparatively little was said relative to their application to external wood surfaces. I would appreciate very much your listing various manufacturers of the paints which were covered in the article together with trade names. Any information which you could supply on this subject would be very much appreciated." *Robert L. Hearn, Jr., Beaumont, Tex.*

► Names and addresses of manufacturers of plastic paints have been forwarded to Mr. Hearn. We would also like to suggest that he consider using wood preserving paint for the job he has in mind.—*Editors.*

Gas Scrubbers

PLANT ENGINEERING:

"We are interested in obtaining an article from a back issue of your publication. The particular article of interest is: 'When It Comes to Gas Scrubbers—Fit the Material to the Service,' October, 1955, pages 106-107.

"If this article is available, please send it to us and bill The Beryllium Corporation." *Thomas E. Kobrick, Industrial Hygiene Technician, The Beryllium Corp., Reading, Pa.*

► Tear sheets of this article have been sent to Mr. Kobrick with our compliments.—*Editors.*

Dust Control Information

PLANT ENGINEERING:

"We would appreciate receipt of a copy of the article titled 'Industrial Ventilation' which appeared in the February, 1957, issue of PLANT ENGINEERING. In addition, any other articles having to do with dust control would be of interest to us." *Robert M. Kuhn, Rees Blow Pipe Mfg. Co., Berkeley, Calif.*

► Past issues of PLANT ENGINEERING have carried a number of articles on dust control and we have forwarded copies of them to Mr. Kuhn.—*Editors.*

Plant Engineering Career in Print

PLANT ENGINEERING:

"This is to request 10 reprints of the article 'Portrait of a Plant Engineer' by H. E. Marrows (of Western Electric Co., Inc.). This article appeared in the May, 1958 issue of PLANT ENGINEERING magazine on pages 115 through 118.

"Also we would appreciate it if you would grant us permission to reproduce the article in our own print shop as we anticipate additional requests for this material. Thank you very much." *F. L. Habich, Engineer, Results, Western Electric Co., Inc., Winston-Salem, N. C.*

► We are pleased to forward 10 reprints to Mr. Habich and give our permission to reprint the article which described the career of a Western Electric plant engineer.—*Editors.*

For more facts circle 528 on Reply Card →

FOUR FEATURES FOR OPERATOR SAFETY

1 STORED-ENERGY CLOSING	2 SPRING-OPERATED OPENING	3 TIME-DELAY INTERLOCK	4 DEAD-FRONT CONSTRUCTION

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Switch and Fuse Equipment

Optimum safety is built into General Electric Switch and Fuse Equipment with stored-energy closing, spring-operated opening, time-delay interlock, and dead-front construction.

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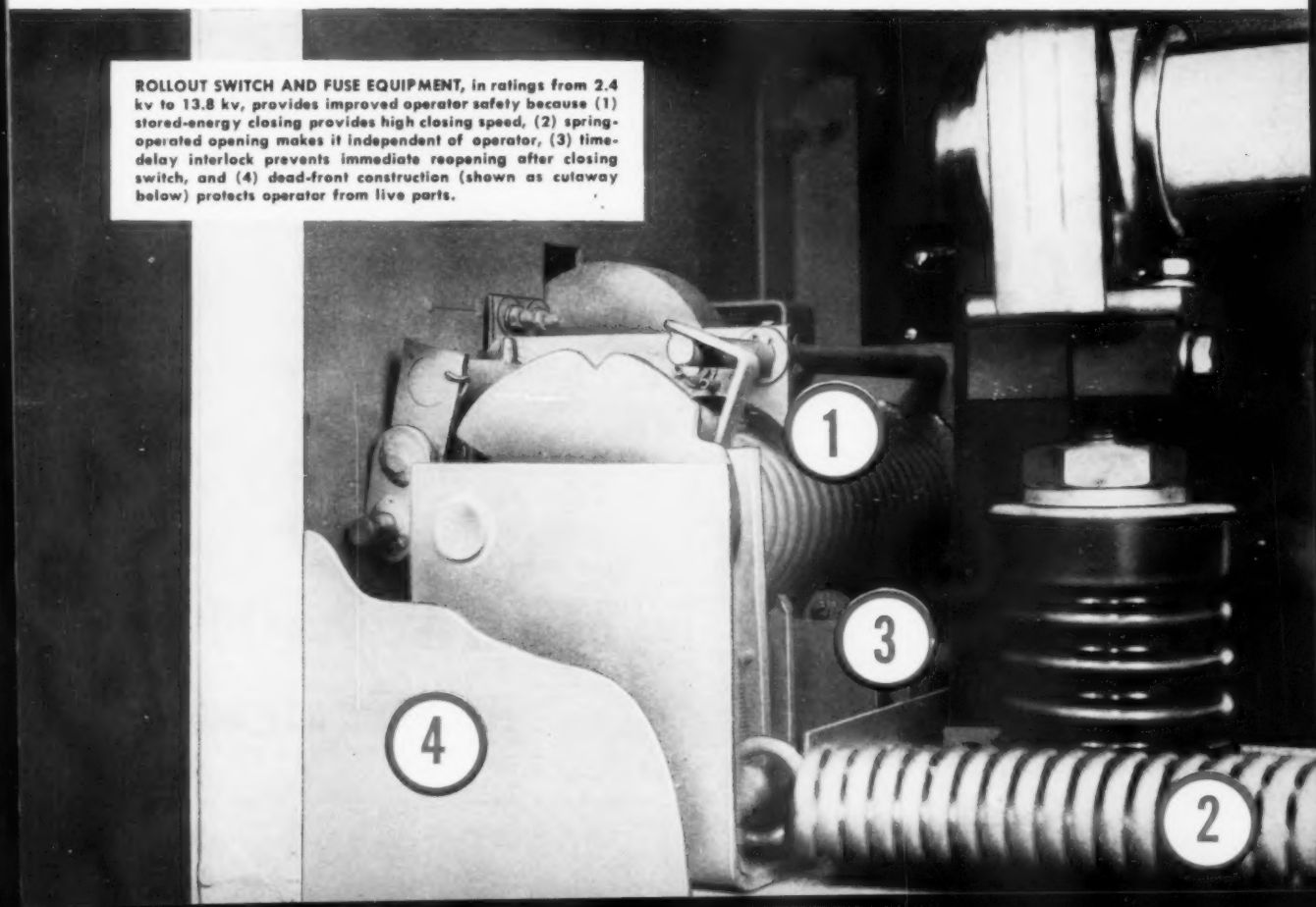

ROLLOUT SWITCH AND FUSE EQUIPMENT, in ratings from 2.4 kv to 13.8 kv, provides improved operator safety because (1) stored-energy closing provides high closing speed, (2) spring-operated opening makes it independent of operator, (3) time-delay interlock prevents immediate reopening after closing switch, and (4) dead-front construction (shown as cutaway below) protects operator from live parts.

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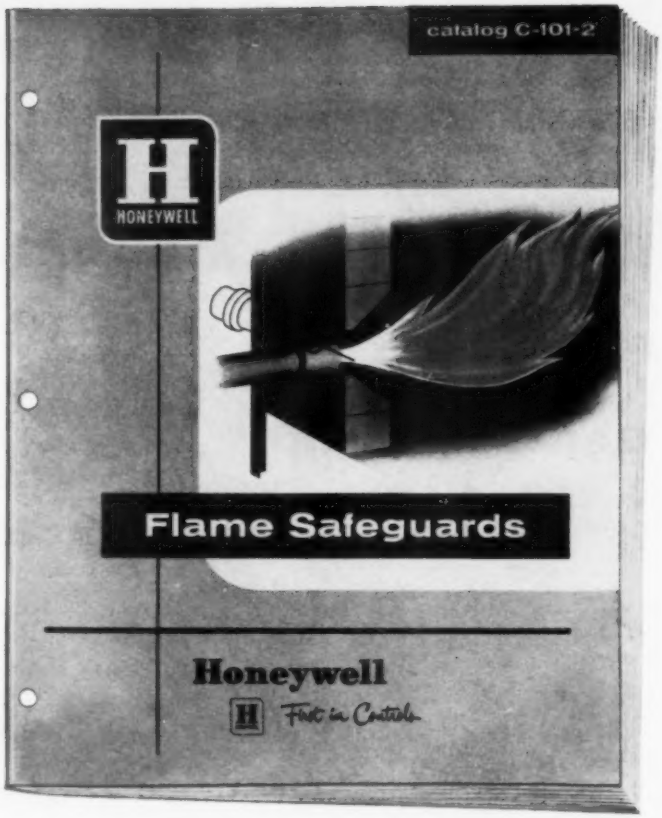

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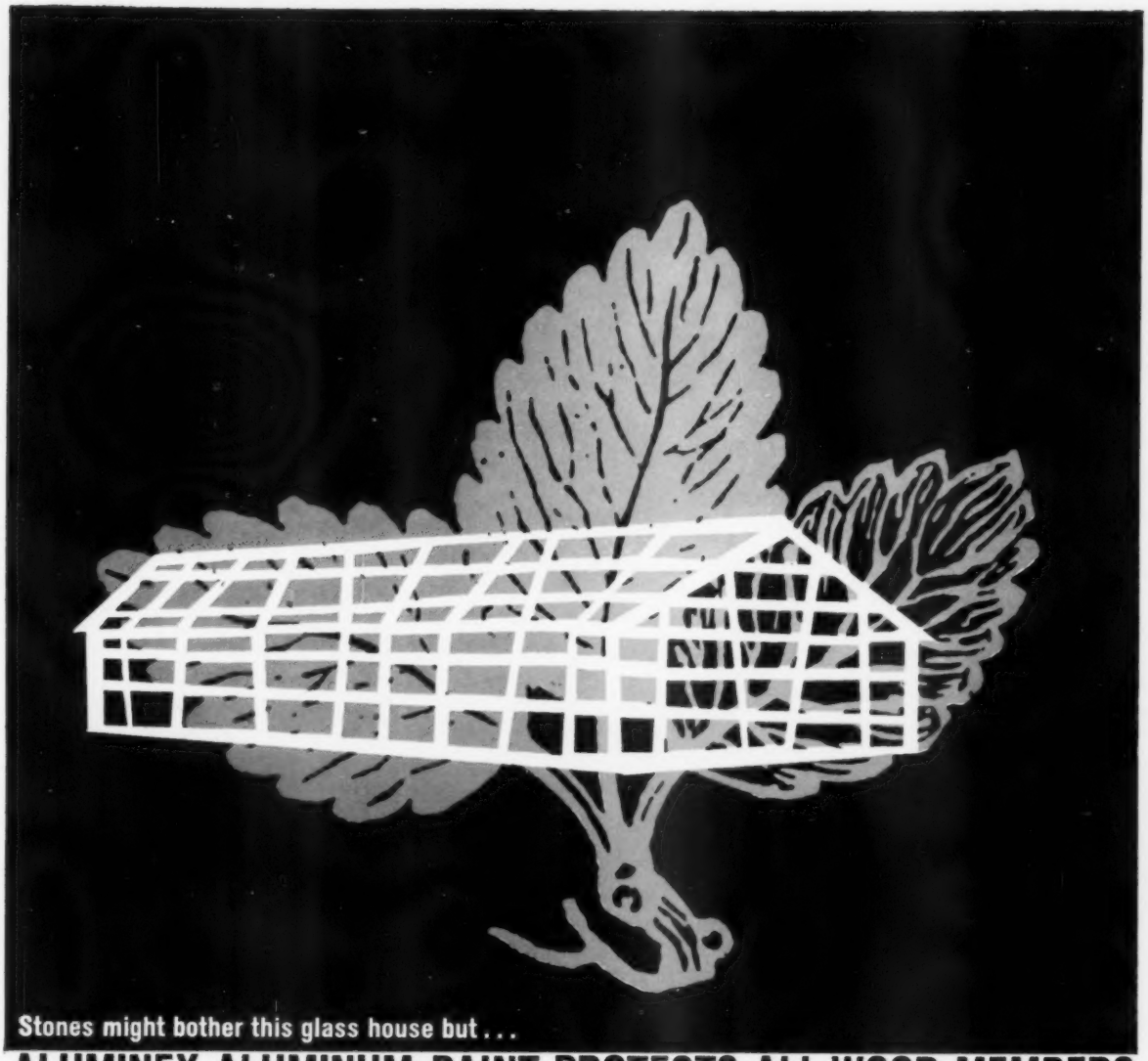

Stones might bother this glass house but . . .

ALUMINEX ALUMINUM PAINT PROTECTS ALL WOOD MEMBERS

Repainting the wood members of a "greenhouse" isn't the easiest job in the world. That's why Metropolitan Greenhouse Mfg. Co., of Brooklyn, N.Y., applies *Aluminex* (an aluminum paint manufactured by Colonial Refining & Chemical Company) to start with, outside and in. Aluminum paint lasts longer.

In fact, you would think that aluminum paint was developed expressly for wood—it's so easy to apply—it goes so far—it hides so well. More important, aluminum paint protects—it resists moisture penetration, prevents "weathering," has twice the durability of ordinary oil paints.

ALCOA® Aluminum Pigment (in *Aluminex* and other good brands) consists of minute, highly polished flakes which "leaf" in layers five to ten deep. This with the top layer forms an almost continuous film of bright aluminum, an effective moisture barrier on weather-exposed wood.

Uniformly applied, aluminum paint completely hides stains, colors, dark spots—provides an elastic, durable film that serves either as primer or finish coat on wood.

ALCOA does not make paint, but ALCOA Pigments are used in more aluminum paints than any other brand. Special formulas have been developed by paint manufacturers to solve individual problems. Paints made to these formulas actually cost less, last longer, give utmost protection against heat, cold, sun, rain, smoke and fumes.

Write today for our two free booklets, *Painting With Aluminum* and *Aluminum Asphalt Roof Coatings Make Time Stand Still.* They contain valuable information on all types of aluminum paints and coatings. Use the coupon.

Metropolitan Greenhouse Mfg. Co. uses *Aluminex* exclusively on all wood members. Shown is a typical sludge bed glass enclosure. *Aluminex* is a quality aluminum paint made by Colonial Refining & Chemical Co., Cleveland 14, Ohio.

For more facts circle 530 on Reply Card

Look for this label when you buy aluminum paint

"ALCOA THEATRE"
Exciting Adventure
ALTERNATE MONDAY EVENINGS

Aluminum Company of America
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PLANT ENGINEERS' DIGEST —so those who rush may read and know what's new

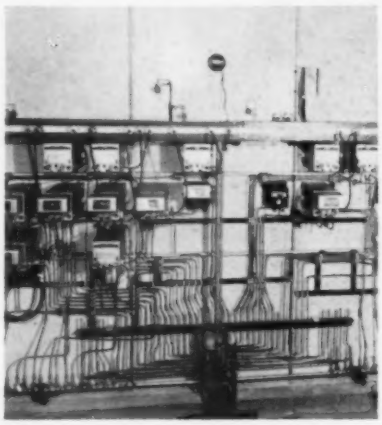
Edited by Marjorie E. Weissman

Nylon Tubing in Control Panel

COLOR-CODED nylon tubing is being used in an instrument-air control panel at Allied Chemical Corporation phthalonitrile plant, to automatically measure and control liquid flow, temperature and pressure.

The nylon tubing is used in conjunction with pneumatic activated measuring and control devices to register physical conditions at specific measuring points on the control panel. Some measurements are performed electrically at the valves and are then transduced to air pressure. The system provides regulation of plant processes involving ammonia and other chemicals.

Tubing with ¼-in. OD with a 30 mil wall was used for the installation. The system uses from three to 15 psi air pressure, although maximum working pressure for the tubing is considerably higher. Color coding is used to indicate air pressure supplied directly from the air line; the air measuring system; and in addition, the air pressure supply which activates the control valves.



Panel in which nylon tubing is used to measure and control ammonia flow

Installation of the panel was facilitated by the use of the easily bent and flared nylon tubing which was held in place by quickly installed clips. *From a release of Barrett Div., Allied Chemical Corp., New York, N. Y.*

One Rack Stores Many Items

FLEXIBLE STORAGE is a must for the Farnsworth Electronics Company of Fort Wayne, Ind., where raw materials used in the manufacture of electronic equipment includes aluminum, copper, brass, steel and plastics. These materials arrive at the plant in various sizes of round tubing, square tubing, angles, channels, I-beams, flat bar stock and sheeting.

One storage rack system is used for all materials. For flat sheeting, which is best stored vertically, the

(Continued on page 40)

Audible Work Instructions Dispense with Blueprints, Allow Workers Freedom of Movement

BY CONVEYING instructions audibly to production workers, blueprints and other written instructions have become unnecessary in a number of jobs.

This new method utilizes a message-controlled magnetic tape recorder. A list of specific instructions required by workers to perform a particular task is prepared and dictated onto tape through a standard Dictaphone microphone.

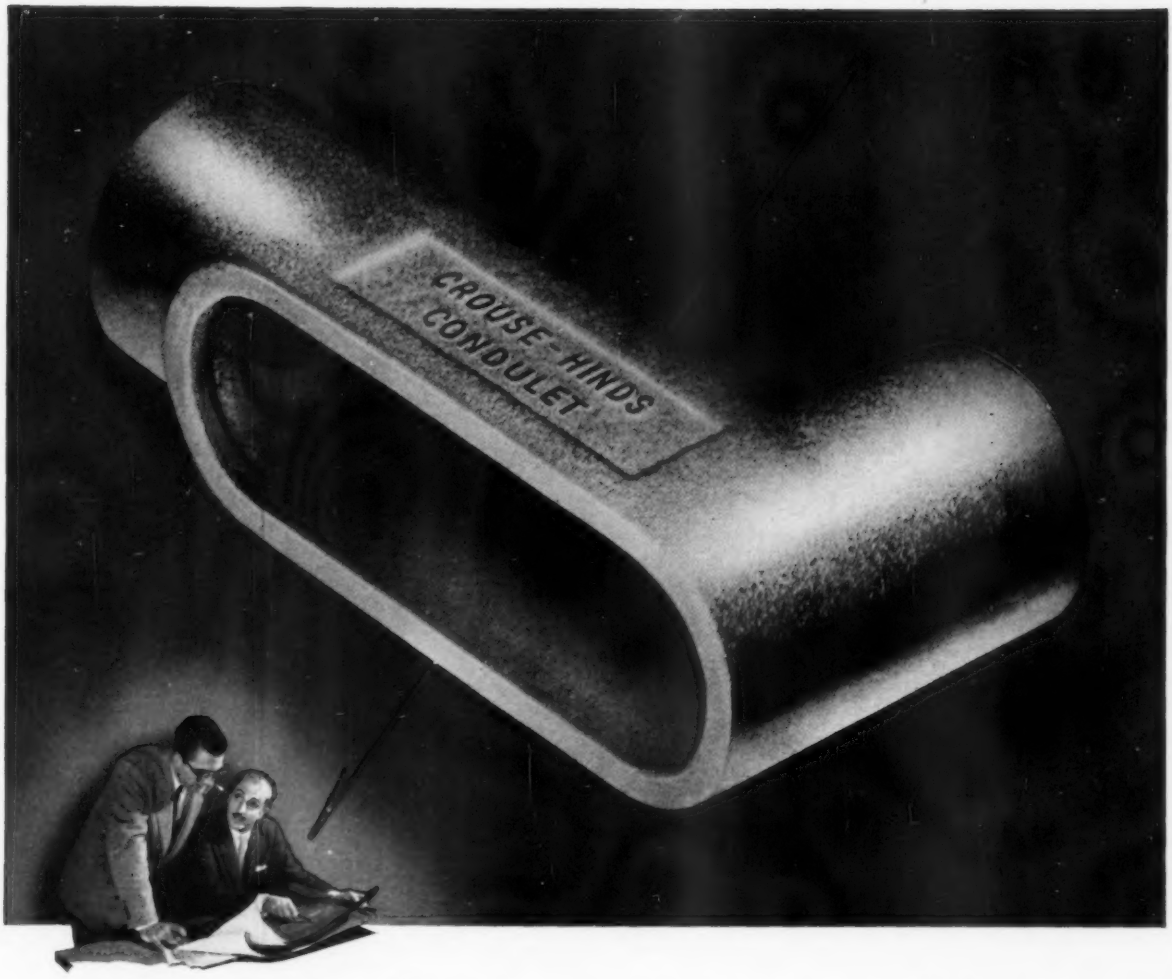
One instruction or work step is dictated at a time. At the end of each message, a button on the microphone is pressed, putting a signal on the recording tape. This signal translates into a stop when the instructions are played back by the worker.

The completed tape is placed in a playback unit, which the worker controls. He hears the messages through a small instrument like a hearing aid. The earpiece is connected to an inductive pick up and transistor amplifier which are worn by the operator. No wires are necessary to connect the earpiece with the main unit, so the operator is free to move about as he works.

Audible instructions are given assembly worker through earpiece (arrow)

When the operator actuates the unit, he hears his first instruction. Upon completion of this message, the machine stops. After the worker has carried out the instruction, he starts the unit again and listens to the next message.

If he wishes to have the message repeated, the worker can reverse the tape. Speed, volume and tone can also be adjusted on this system which is known as Audibly Instructed Manufacturing Operations. *From a release of Westinghouse Electric Corp., Pittsburgh Pa. and Dictaphone Corp., New York, N. Y.*



Now, more than ever, engineers specify: "CONDULETS*... or approved equal"

After 51 years of use in every conceivable application, Condulets remain the standard of quality for rigid conduit fittings.

It's not hard to see why. Pick up any Obround Condulet, for example, and note such features as these:

TAPER TAPPING: Condulet threads are taper tapped to match tapered conduit threading . . . giving you a rigid joint that will not loosen . . . insuring *permanent* ground continuity!

INTEGRAL BUSHING: A smooth, rounded, burr-less surface that protects wire insulation.

WEDGE NUT COVER FASTENER: This exclusive Crouse-Hinds feature is part of the cover itself. Screws can't fall out. No screw holes to locate. No protruding screw hole ears to damage cable.

LONGER HUBS: Conduit can be tightened completely without bottoming on integral bushing. And there's generous surface space for good wrench hold.

MATERIAL: Feraloy, a special alloy that is strong and tough, resists corrosion . . . gives sharp, full threads.

FINISH: A triple-layer treatment that exceeds Federal and U.L. specs for longer-lasting protection.

Where else can you find all (or even *most*) of these features? You *can* find them all in each of the 45 types of Obround Condulets . . . sizes ⅛" to 6".

There is a type for every need, including a wide selection of interchangeable covers and wiring devices. Just call your Crouse-Hinds distributor and ask for "Condulets!"

*CONDULET is a coined word registered in the U.S. Patent Office. It designates a product made only by the Crouse-Hinds Company.

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• CONDULET® ELECTRICAL EQUIPMENT (Explosion-Proof and Conventional) • FLOODLIGHTING • TRAFFIC CONTROL SYSTEMS • AIRPORT LIGHTING and WEATHER MEASURING EQUIPMENT

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For more facts circle 531 on Reply Card

PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

Racks consisting of three basic parts are arranged to store variety of items

racks are turned on their sides. To facilitate the sliding of sheeting in and out of the racks, small, channel-like pans were formed and slipped across the upright frames which form the shelves.

Two standard 44-in. deep racks were placed one behind the other to form a rack 88 in. deep for storage of aluminum, copper, brass, and steel sheets in 8 ft to 12 ft lengths.

The racks consist of three basic parts: rigid one-piece frames, horizontal support bars, and floating wedges to lock them together. To assemble, a floating wedge is inserted into the slots in the upright frame and is locked to the safety support bars. Slots in the vertical columns are spaced on three-inch centers to permit the shelf adjustment. *From a release of Sturdi-Bilt, Materials Handling Div. Union Asbestos & Rubber Co., Chicago, Ill.*

Slurry Seal for Pavement

SLURRY SEAL, developed by the Los Angeles County and California State Highways department has been used to resurface five runways and 13 taxiways, comprising 1,136,400 sq yd, at the Marine Corps Air Station at El Toro, Calif.

The slurry is a mixture of fine sand, crushed rock and rock dust combined with a mixing type asphalt emulsion and water to form a smooth, creamy-textured slurry which readily flows into and seals voids, cracks and spalls.

Use of the slurry eliminates all loose aggregate and gives a non-skid surface to the runways.

Particular attention must be paid to certain features to insure a satisfactory seal job. The subgrade must

Photo: Courtesy The Military Engineer

Truck and spreader box deposit slurry along runway at approximately 6 mph

be structurally sound because the slurry does not have any structural characteristics. The surface must be clean prior to the sealing operation to make possible a good bond; a screen must be used on the top of the spreader box to prevent oversize or deleterious material from being chuted into the box; and it is imperative that the material be agitated prior to commencing a run.

Prior to the application of the seal coat on the runway and taxiways, the pavement was coated with a diluted emulsified asphalt as a tack coat.

From six to 10 hours after surfacing, the newly laid slurry was compacted by a pneumatic-tired tractor and two pneumatic wheel eight-ton rollers in tandem, making two passes with the tandem unit.

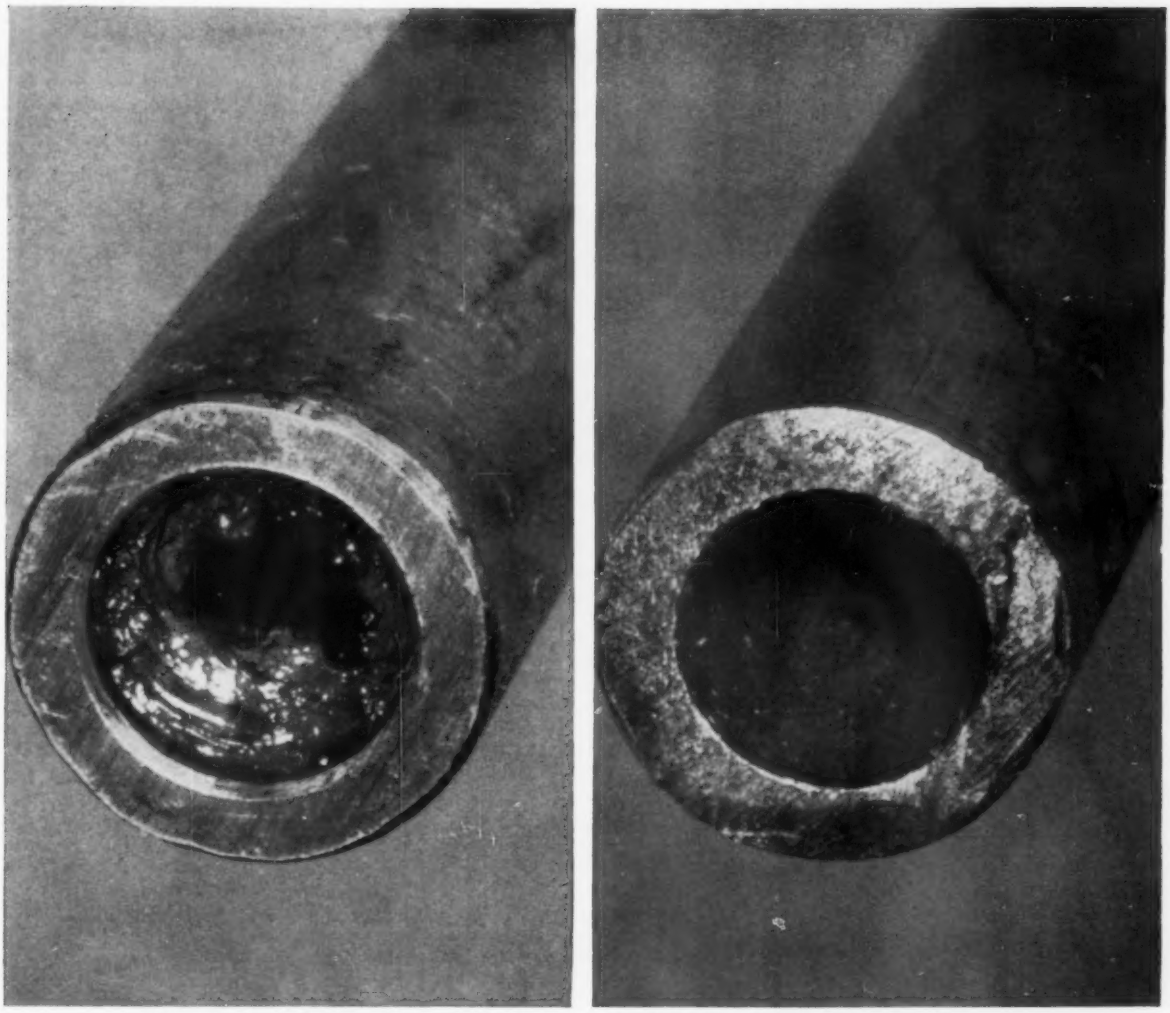
Major equipment used on the job included a 12-ft by 7-ft slurry box; a mobile slurry seal batching plant and a 10,000-lb aggregate hopper with a springless scale. Speed of the spreader unit was approximately 6 mph on a long run and 3 to 5 mph on shorter passes. One five-ton truck load of slurry was sufficient for a ⅛ in. cover on a 12-ft wide lane approximately ½ mile long. *From The Military Engineer, published by The Society of American Military Engineers, Washington, D. C.*

Dry Chemical Guards Against Fire in Lathing Operation

If fire should occur in automatic lathe, a fusible metal link will melt and actuate the extinguisher, seen at left, flooding interior of lathe enclosure with 30 lb of dry chemical. (From a release of the Ansul Chemical Company, Marinette, Wis.)

New Doors for Coke Ovens

NEW DOORS and jambs made of ductile cast iron that were developed in collaboration with Koppers Co., are being used on a battery of 35 coke ovens at our Neville Island



This sludge-clogged hydraulic line . . . looked like this, after cleaning with a Sunvis 700 oil.

With Sunvis 700 oils, you can clean hydraulic systems and keep them clean

Sludge, caused by high temperatures, and by water, dirt, cutting oils, paint, packing, and by many other contaminants, clogs lines and cuts efficiency.

Sunvis* 700 oils keep these contaminants in suspension, and carry them away to the filters, thereby keeping systems clean and preventing costly shutdowns. In fact, many seriously fouled systems can be cleaned and kept clean permanently by a switch to Sunvis 700 oil. A single charge of Sunvis 700 oil can keep even a continuously contaminated system running smoothly for months, often *years*.

Your Sun man knows Sunvis 700 oils inside out. He has facts, figures, and case histories that prove their quality... quality that means *money in your pocket*. Call him in soon. Or write to Dept. PY-8.

Industrial Products Department

SUN OIL COMPANY, Phila. 3, Pa.

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In Canada: Sun Oil Company Limited, Toronto and Montreal

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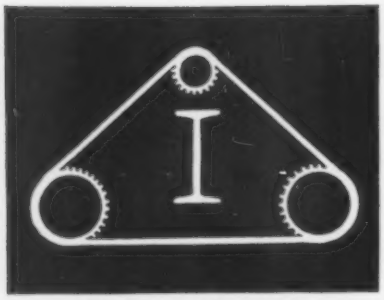
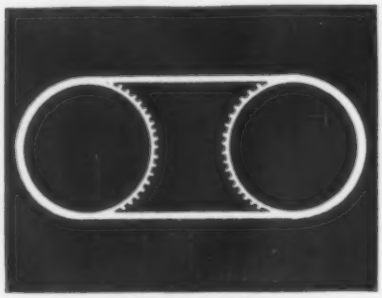
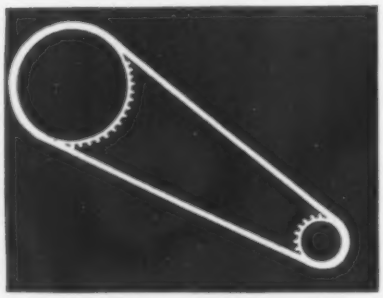


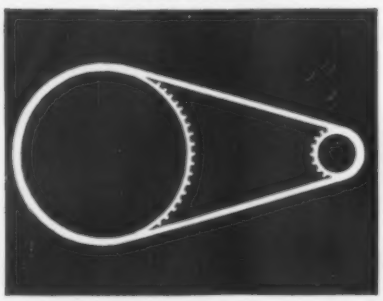
AROUND OBSTRUCTIONS



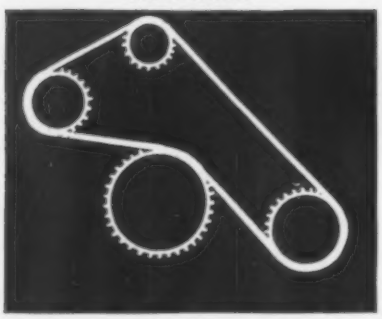
SHORT CENTERS



LONG CENTERS



HIGH RATIOS



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Diamond Flexible Couplings for end-to-end shaft connections to 725 H.P.

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DIAMOND ROLLER CHAINS

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PLANT ENGINEERS' DIGEST

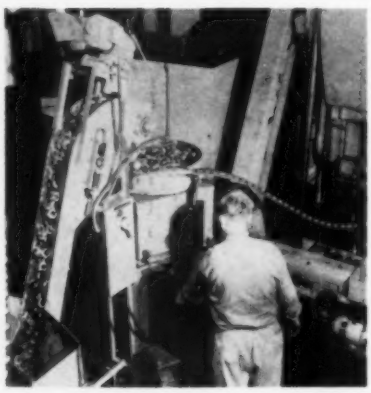
(Digest begins on page 38)

Pittsburgh, Pa. plant. They materially reduce gas leakage and smoke from the ovens and permit carrying a higher heat near the doors, thus minimizing "green ends." Green ends are layers of coke still bearing uncoked coal particles.

During the coke removal process, green ends coming into contact with the outside air cause much of the smoke associated with the operation. Reduction of the green ends minimizes the smoke and helps alleviate air pollution.

New brick work designs, achieved through the use of interlocking "hammerhead" bricks, will prolong the life of the reconstructed battery of coke ovens and help guard against leakage of gas and smoke. *From a release of Pittsburgh Coke and Chemical Co., Pittsburgh, Pa.*

Space-Saving Conveyors



Magnetic conveyors have reduced manual handling time, conserved aisle space and speeded production at automotive manufacturing plant. (From a release of Eriez Manufacturing Co., Erie, Pa.)

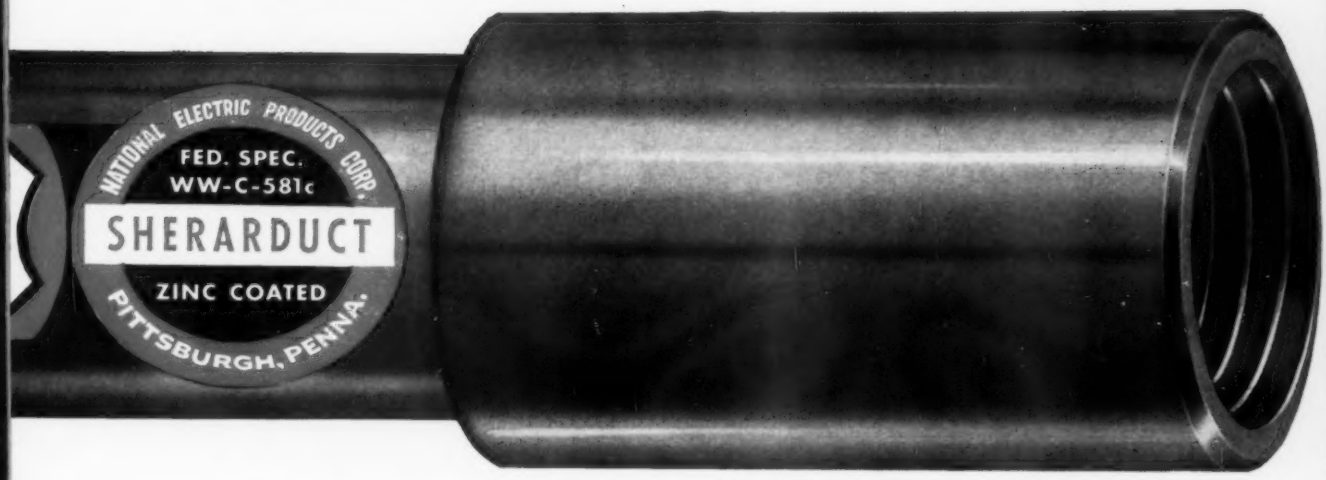
Explosions Form Metal Parts

BY USING a small explosive charge, metal can be formed into desired shapes.

The operation is based on knowledge gained from wartime explosions when ship designers studied underwater blasts to learn about damage from mines and torpedoes.

Manufacturing research engineers noted that these violent explosions sometimes produced improbable re-

HERE'S *double* PROTECTION



NOW galvanized Sherarduct is coated with NEW

FORMULA MVC-1

the modified vinyl copolymer that provides the most effective barrier against corrosive agents of all kinds

National Electric has developed a new way to combat conduit corrosion. It is called Formula MVC-1, a new modified polyvinyl chloride resin coating that's available only from National Electric.

Here's what MVC-1 does to even further increase the protection against corrosion offered by the Sherardizing process of galvanizing.

RESISTANCE TO CORROSIVE ATTACKS—In accelerated salt spray, sulphuric acid and caustic tests conducted by the Pittsburgh Testing Laboratories, new Sherarduct with Formula MVC-1 far outlasted all hot dipped and other high-grade coated and galvanized conduits tested.

RESISTANCE TO FLAKING—Formula MVC-1 makes a tight, uniform, adhesive coating that withstands bending without cracking or flaking.

TEMPERATURE RESISTANCE—Formula MVC-1 is extremely resistant to high and low ambient temperatures and will withstand the majority of all industrial temperature conditions.

NOW ADD THIS NEW CORROSION RESISTANCE TO SHERARDUCT'S OTHER FEATURES

1. The Sherardizing process of galvanizing that alloys zinc with the conduit walls.
2. Normalized, highly ductile steel for easy bending and threading.
3. Zinc protected threads for complete end-to-end protection.

These are the features that convince architects, engineers and contractors it is best to specify National Electric Sherarduct when real corrosion protection is required. Write for complete information on new Sherarduct today.

Listed by Underwriters' Laboratories, Inc.

Sherarduct *with MVC-1* **is Galvanized Conduit at Its Best**

National Electric Products Corp.

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DOUBLE

ACTION Double action diaphragm hand pump that works easily with push-pull operation. Pumps up to 20 gallons per minute.

SERVICE Made for quick easy service of light-medium oils, cutting fluids, alcohol, lube and flushing oils, gasoline, kerosene and fuel oil.

DEPENDABILITY

Many exclusive features, plus flow with both push and pull strokes assure dependable delivery.

QUALITY Built for extra service with Nylon shaft bearing, integral O-Ring seal, double diaphragms, non-clogging screens and self-closing valves.

Here is the ideal economical, easy to use hand pump for every place in your plants. No costly maintenance . . . always ready for use. Write for folder showing all uses and models.

FOR DISPENSING . . .
cutting oils, paints, solvents and almost all types of liquids. May be used on drums or on existing pipelines.

FOR REFUELING
of industrial lift trucks, tractors, plant trucks, gasoline driven compressors and small auxiliary gas and diesel engines.

THE WAYNE PUMP COMPANY
Industrial Division—Fort Wayne 4, Indiana
A Division of Symington-Wayne Corporation

Wayne

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PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

Engineer shows part formed by blast

sults. Some metals were damaged, or deformed, beyond recognized elongation and tough alloys were sometimes shaped around or over a much softer metal.

Putting dynamite to work has resulted in duplicating virtually every operation of the drop hammer, press, brake and stretch press, including shrinking, bending, shearing, piercing or a combination of these, plus embossing, inlaying and joining.

Dynamite used for the tests is measured in grams or ounces. The metal to be formed is placed over a tool or basic work form and the blast set off at the bottom of a water-filled tank. *From Convairiety, published by Convair, Div. of General Dynamics Corp., San Diego, Calif.*

Corrugated Aluminum Used for Conveyor Covers

COVERS MADE of specially corrugated aluminum sheet have been installed above 7500 ft of conveyor line used to carry bauxite ore at our Gramercy, La., plant.

Ease of fabricating, handling and fitting sections of light-weight aluminum made it possible to double the rate of erection compared to using other types of corrugated covers and also to limit the size and

Neoprene serves as "flexible armor" on collapsible container for liquid cargo

A collapsible container that holds 3400 gallons of liquid cargo is now being used by Industrial Molasses Corporation of Leonia, N. J. After a molasses delivery, the empty container is rolled into a bundle only 7' x 4" long by 21" diameter and stowed with the trailer's return load of dry cargo.

The outside covering of this new shipping container is made of Du Pont neoprene chiefly because it resists the effects of sunlight and weather. The neoprene surface will remain flexible in any climate, won't crack when unrolled after storage.

Neoprene adds many other advantages as well . . . such as resistance to abrasion, rough handling, oil and chemical attack. This balanced combination of properties makes neoprene the answer not only for collapsible containers, but also for many other maintenance products you use. Mail the coupon today for additional information on Du Pont elastomers.

ELASTOMERS IN ACTION HYPALON® • NEOPRENE

DU PONT
REG. U. S. PAT. OFF.

Better Things for Better Living
. . . through Chemistry

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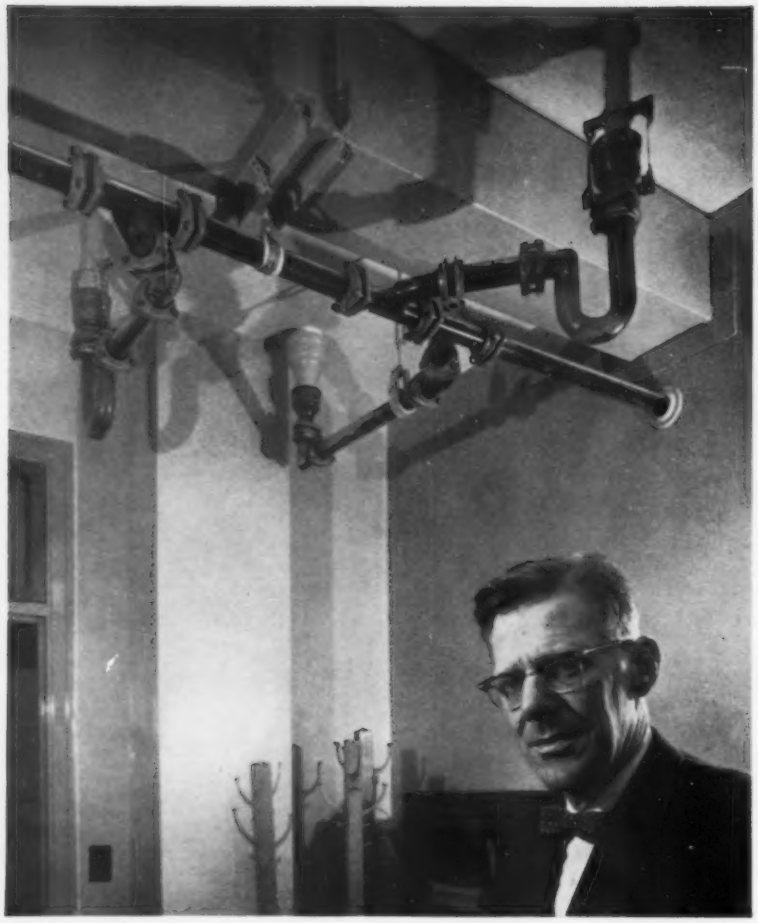
☐ I am particularly interested in _____

☐ Send me a free copy of *The Du Pont Elastomers* (a review of properties of neoprene and HYPALON).

☐ Add my name to the free mailing list of the *Elastomers Notebook* (contains articles based on uses of Du Pont elastomers in industry).

E. I. du Pont de Nemours & Co. (Inc.)
Elastomer Chemicals Dept. PL-8
Wilmington 98, Delaware

Name _____
Firm _____
Address _____
City _____ State _____



Mr. Theodore R. McClure,
Asst. Chief Chemist at Sun Oil Company's Marcus Hook, Pa. Testing Lab, tells you . . .

"Here's how we keep our drainline free from costly, patchwork mending"

"Until we installed *glass* drain pipes, acid drippings were beginning to menace our personnel and equipment.

"Maintenance men were in our building regularly, recaulking weakened joints.

"Then three years ago we installed corrosion-resistant PYREX® pipe. Since then there have been absolutely *no* leaks, and maintenance men have *not once* been called in for pipe mending.

"Installation of this 250-foot system, including ripping out the old system, was a quick job—with a two-man crew working about 60 hours. That's only *about ⅓ the time* required for installation of other types of pipe.

"Working with *glass* made it easy. Only a few tools were required. Cutting, beading, and installation seldom took more than 15 minutes. And the light weight of glass made it easy to handle, required fewer brackets to hold it up.

"Now our *glass* drainline is carrying a continuous flow of highly corrosive acids and alkalis—from 8:00 A.M. to 5:00 P.M. daily—absolutely free from costly, patchwork mending."

Find out more about PYREX pipe for *your* drainline. If *you* handle corrosives, you'll never know how little you can spend for maintenance and installation until you install PYREX pipe. Write for Bulletin PE-30 for all the details.

Corning means research in Glass

CORNING GLASS WORKS
10-8 Crystal Street, Corning, N. Y.

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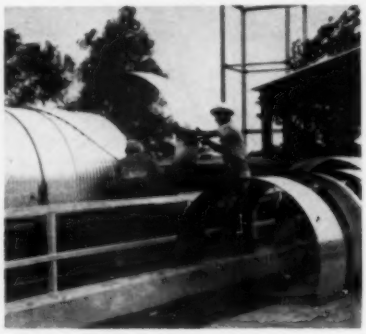
PLANT ENGINEERS' DIGEST

(Digest begins on page 38)



Bauxite ore is carried on conveyor protected by corrugated aluminum covers

amount of handling equipment, permitting reductions in installation costs. Initial and maintainance painting was eliminated.

Aluminum sections were corrugated and curved by Elwin G. Smith and Co. Inc., Pittsburgh, Pa., from 0.064 gage, 29⅛ in. wide, coiled sheet. The sections are U-shaped and have vertical sides so that the semi-circular crown has a center of curvature lift 6 in. above the belt line. Stainless steel, hex-headed screws were used to attach the sections to the conveyor line frame.

A weather-tight seal was obtained by caulking side laps with a ½-in. bead of aluminum pigmented mastic and using ¾-in. self-tapping screws 12 to 24 in. on centers as lap fasteners. *From a release of Kaiser Aluminum & Chemical Corp., Oakland, Calif.*

Abrasive Wheel Feeds Paper Roll

IN A MACHINE which converts a roll of blank paper to individually printed and addressed bills for business firms, a roller was needed to provide positive feed of paper through the machine. Because the roller passed over freshly applied ink, a further requirement for the feed roll was that it should not smudge the ink.

A small grinding wheel was selected for the feed roll. The surface of the wheel, consisting of many sharp particles of abrasive, advances the paper without slippage, and since there is no relative motion between the ink and the roller, the

Pat. Applied For

New RIDGID Hex Wrench

gives you Time-Saving, Positive, 4-Sided Grip on Hex Nuts, Square Nuts, Valve Packing Nuts, Unions, Gas Cocks

Here's the adjustable wrench you've always needed for hexes, squares and flatheads, rough or finished. Extra-useful on every job. No more skinned knuckles or rounded nut shoulders. New wide-open jaw goes on easy . . . won't slip off. 4-sided grip gives extra leverage. Stays to adjusted size during use.

Famous RIDGID heavy-duty construction with guaranteed housing. Narrow jaw design makes work easy in tight places even on thin nuts. Comfort grip I-beam handle has handy hang-up hole. The new RIDGID Hex Wrench gives you more for your money than wrenches costing twice as much. Try it, buy it at your Wholesaler's.

Available in 3 Sizes

- **No. 11, 3/8" to 3/4"**
- **No. 17, 5/8" to 1 1/4"**
- **No. 25, 1" to 2"**

The Ridge Tool Company • Elyria, Ohio, U.S.A.

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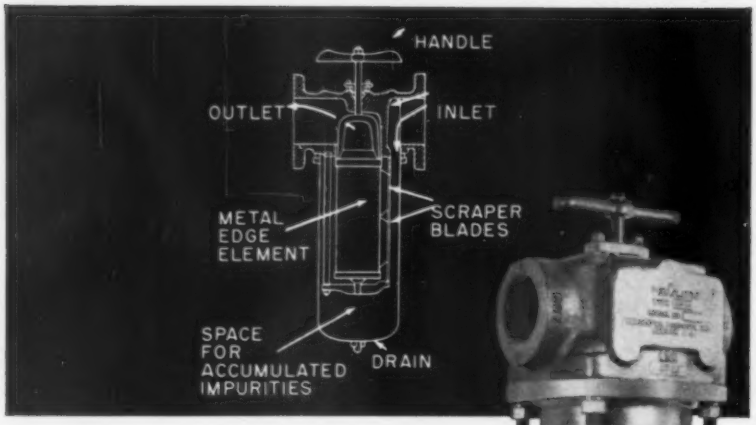

This one standard Purolator filter is

EXACTLY RIGHT for all these fluids:

- inks
- paints
- varnishes
- food products
- greases
- process fluids
- fuel and lube oils

SPECIFICATIONS: This Purolator filter—model G-141J—is designed for filtration in a range upward of 40 microns.

It can be installed on pressure or suction side of pump.

It is recommended for capacities of from 6 to 200 GPM, dependent on viscosity. Spacing varies from .0010 to .020.

Relief valves set from 10-12 (generally 15 to 20) to 50 PSI are incorporated in several models.

Motor driven knife blade to clean element can be furnished whenever conditions make manual rotation impractical.

Maximum pressure: 125 PSI; Weight: 37 lbs. Equipped with simplex full-flow metal element oil strainers.

Available in all stainless steel construction for corrosive liquids, process fluids, food products.

If this filter's specifications recommend it for a problem of yours, write for catalog sheet to Dept. PF2-83.

Filtration For Every Known Fluid

PUROLATOR PRODUCTS, INC.

Rahway, New Jersey and Toronto, Ontario, Canada

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PLANT ENGINEERS' DIGEST

(Digest begins on page 38)

Abrasive wheel (arrow) used as positive action feed roller, prevents ink smudges

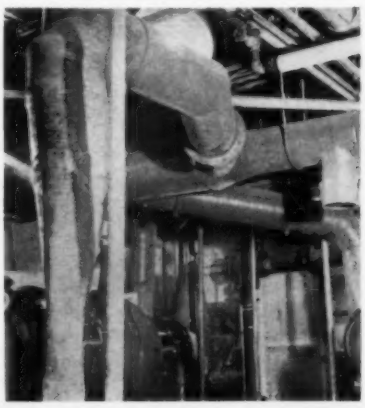
abrasive points do not smudge ink.

The same machine also uses two drums covered with abrasive paper to serve as impression rollers, pressing the paper against printing rollers beneath, because of the paper's non-smudging qualities. *From a release of Norton Co., Worcester, Mass.*

Venting Corrosive Fumes

CORROSIVE, chlorinated organic fumes, by-product of a chemical process in our plant, are vented from chemical reactors through fiber glass reinforced polyester ducts.

The ducts were fitted into limited space in an existing building. After two years of continuous use, the ductwork shows no evidence of corrosion. *From a release of Hooker Electrochemical Co., Niagara Falls.*



Glass reinforced polyester ducts vent fumes from chemical process reactors

For more facts circle 540 on Reply Card →

NEW from Standard Oil

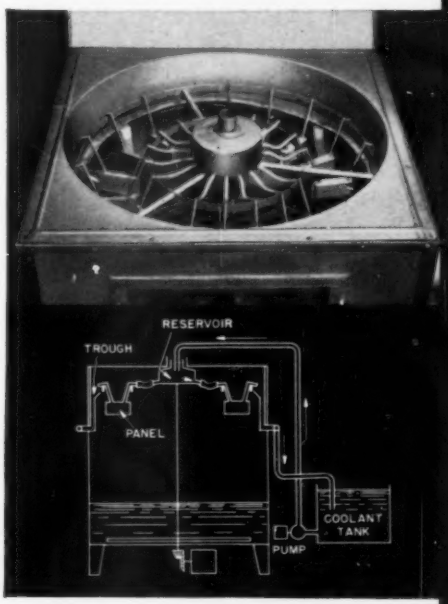
THE MAGIC BOX

Corrosion steals $5.5 billion from industry annually. Standard Oil is in the forefront of the fight to control this loss. Standard's research scientists have developed a new method for measuring the effectiveness of rust preventives. This new test takes less than one-twentieth of the time of previous tests—and is about three times as precise.

Using a controlled humidity cabinet for testing corrosion, these Standard research men installed a system for cooling metal test panels (previously treated with rust preventive) so that their surface temperatures are lower than the temperature in the cabinet. Temperatures of panel surfaces and of cabinet atmosphere are held accurately. Controlling the temperature of the panels controls the rate at which water condenses on them. This in turn (for the first time) permits accurate control of the amount of condensation on the panels. Rust preventives are more speedily and precisely tested. Science, as a result of this work, has a new tool with which to test corrosion.

This is the research pay-out industry receives from Standard Oil. This is the something extra that backs up the Standard industrial lubrication specialist who calls on you. This is the something extra found in the products he sells.

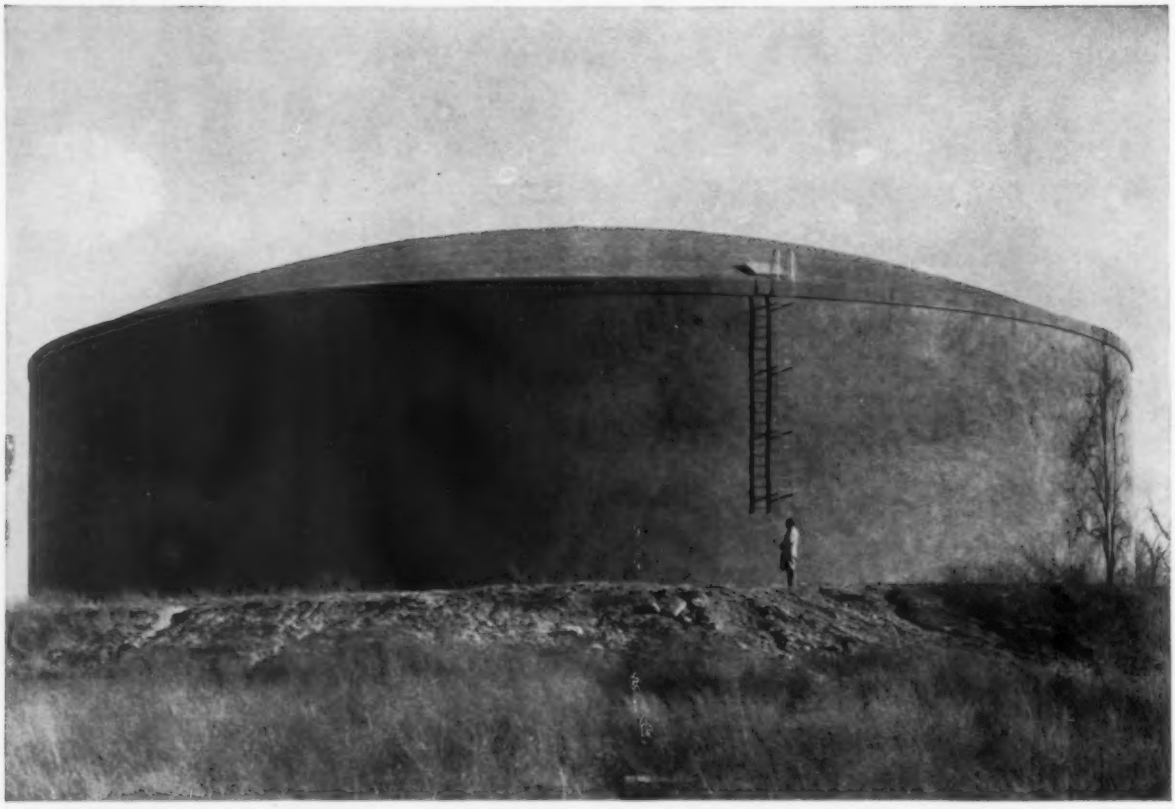
To know more about how Standard Oil industrial lubrication specialists—and Standard's research program—can help you, call the Standard Oil office nearest you in any of the 15 Midwest and Rocky Mountain states. Or write **Standard Oil Company, 910 South Michigan Avenue, Chicago 80, Illinois.**



Top view and cross section of Accelerated Condensation Corrosion Test cabinet.

You expect more from STANDARD and get it!

Edgar A. Dieman, Standard Oil scientist, inventor of new Rust Preventive System, inspects metal panel that has undergone test in the humidity cabinet.



This prestressed concrete water tank was constructed in Kettering, Ohio, by Preload Concrete Structures, Inc., Westbury, L. I., N. Y. The Parlon-based finish, "Moisture and Chemical Resisting Enamel," is made by the Lowe Brothers Co., Dayton, Ohio.

200 GALLONS OF PARLON-BASED PAINT PROTECT THIS 3,000,000-GALLON TANK

There are many reasons for the ever-increasing preference of paints based on Hercules Parlon® chlorinated rubber. Wherever protective coatings must meet a challenge from the weather or the corrosive effects of chemicals, Parlon-based paints are providing longer service at lower long-term cost.

For this water tank in Kettering, Ohio, the coating selected had to meet two main tests—it had to be attractive and it had to require little maintenance. Parlon passed on both counts. Only 200 gallons in a single coat were needed to provide the tank with an attractive green coating. Fifteen months later the paint job retains its "just like new" look.

Perhaps the many unusual properties available in Parlon-based coatings can solve your own maintenance problems. Your local paint supplier can provide additional information, or write direct to Hercules.

Cellulose Products Department

HERCULES POWDER COMPANY

INCORPORATED

900 Market Street, Wilmington 99, Delaware

CR59-2

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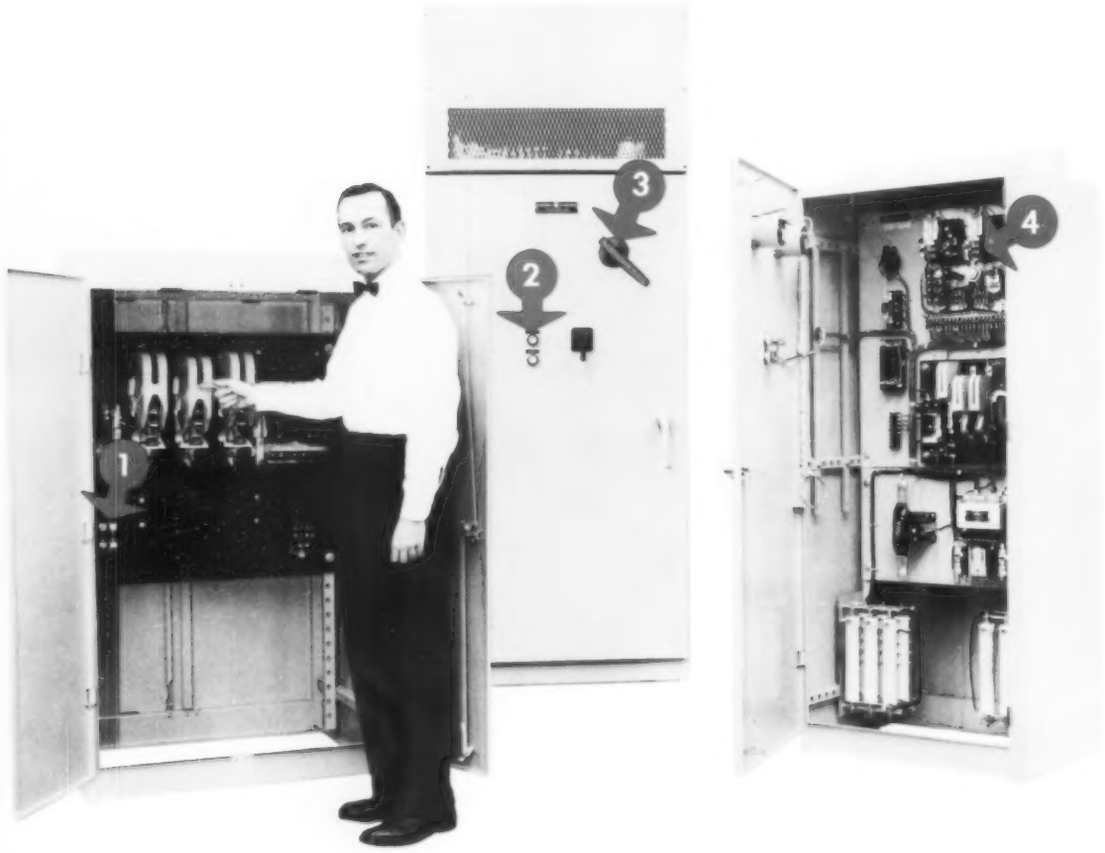
IN 96 SECONDS, *see how every member of General Electric's motor-control family offers feature after feature for . . .*

Greater protection of your equipment and personnel

GENERAL ELECTRIC

Get greater protection of equipment and personnel with



LOW-VOLTAGE INDIVIDUAL STARTERS

For squirrel-cage, wound-rotor and synchronous motors

1. **OVERLOAD RELAYS** on General Electric's individual motor controls constantly protect the motor against damage from overloads.
2. **UNDERVOLTAGE PROTECTION** is provided by momentary-contact pushbuttons on applications where automatic restarting after power loss is not desired. Undervoltage release by maintained-contact pushbuttons is available for applications where automatic restarting is desired.
3. **SHORT-CIRCUIT PROTECTION** against faults up to 100,000 amperes can be provided. Fuses, circuit breakers, and fuse-breaker combinations are available.
4. **SYNCHRONOUS MOTOR PROTECTIVE SYSTEM** allows maximum utilization of the motor, yet gives full protection against out-of-step operation with field applied. Squirrel-cage winding has graduated protection that prevents overheating during starting, yet does not cause unnecessary tripping.

Write for bulletin GEA-6584 to Sect. 783-8, General Electric Co., Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

LOW-VOLTAGE MOTOR CONTRO

For flexible grouped control of mot

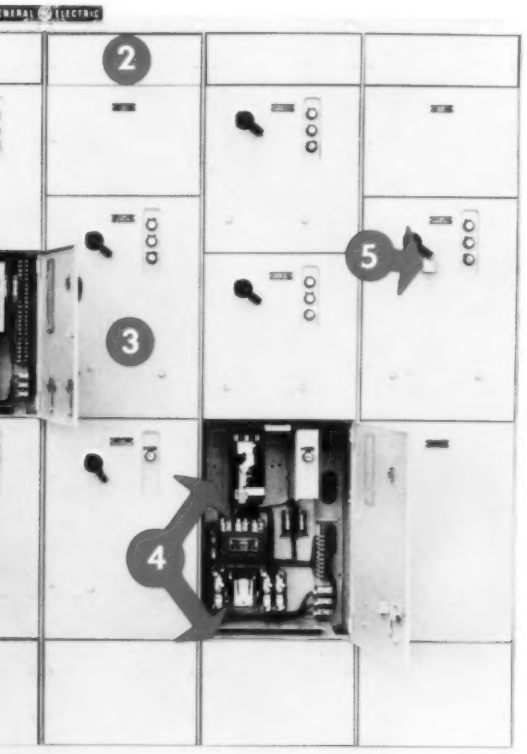
1. **INTERLOCKED DOOR HANDLES** automatically operate the breaker or fused switches and de-energize the starter units when handles are turned to "OPEN" position, thus the doors cannot be opened when the starter is energized.
2. **SHORT-CIRCUIT PROTECTION** up to 100,000 amperes is available with fuses or reactor in incoming line.
3. **STURDY ENCLOSURE** is constructed of bolted sheet-metal with an "I-beam" frame. This protects starters

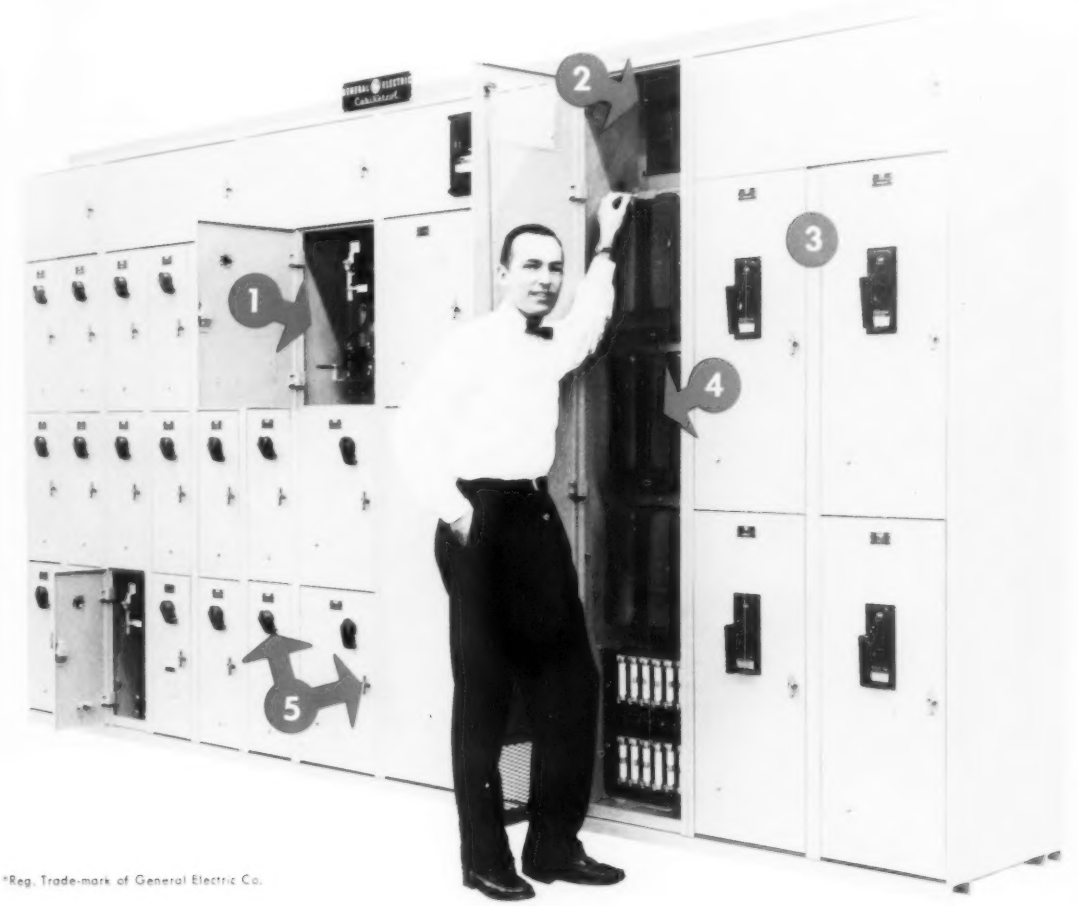
Write for bulletin GEA-4979 to Sect. 783-8, Gener

Progress Is Our Most Imp

GENERAL

with these features of General Electric motor c





*Reg. Trade-mark of General Electric Co.

NTROL CENTERS

of motors up to 400 hp

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and internal wiring from mechanical damage. Full-length floor sill adds to strength of enclosure.

4 **ISOLATED STARTER COMPARTMENTS** are separated from the main power bus and other starter compartments by horizontal and vertical metal barriers.

5 **LOCKING DEVICE** on compartment handle can be used to lock starters in position to prevent unauthorized operation and to prevent starter from being energized during maintenance.

783-8, General Electric Co., Schenectady, N. Y.

Most Important Product

ELECTRIC

LOW-VOLTAGE CABINETROL* POWER CENTERS

For custom-engineered grouped control of motors up to 900 hp

1 **METAL BARRIERS** between starter compartments protect personnel during inspection and maintenance. Starter compartments are isolated from each other and from the main bus.

2 **RUGGED ENCLOSURE** of these General Electric power centers is constructed of welded one-piece sheet steel to protect starters and internal wiring from mechanical damage.

3 **SHORT-CIRCUIT PROTECTION** up to 100,000 amperes is available for the power center in any one of three systems: fully rated, cascade, or backup.

4 **CAPACITOR BANKS** for power-factor correction can be provided to protect against excessive power losses.

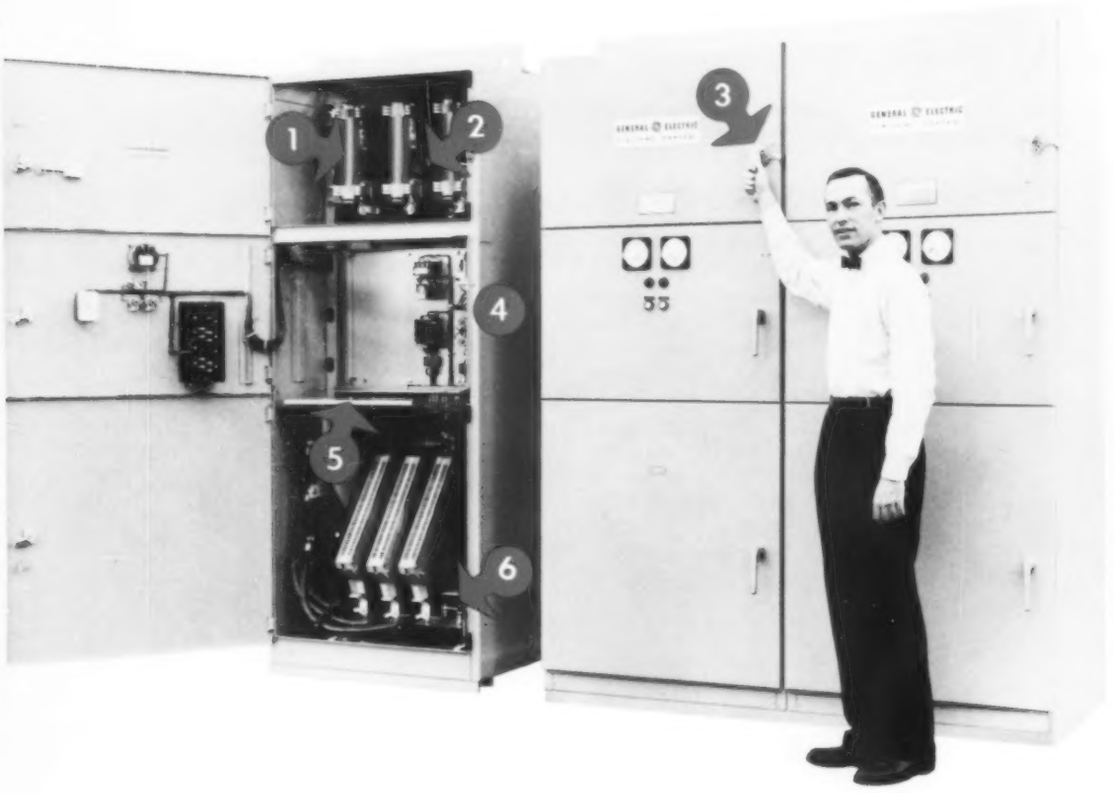
5 **INTERLOCKED DOOR HANDLES** on the Cabinetrol power centers require that the starter unit is de-energized before door can be opened. Breaker handle can be locked in position and each compartment has a separate cylinder lock to prevent unauthorized entry.

Write for bulletin GEA-3856 to Sect. 783-8, General Electric Co., Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC

and personnel with these features



*Reg. Trade-mark of General Electric Co.

MEDIUM-VOLTAGE LIMITAMP* STARTERS

For individual or grouped control of motors up to 3000 hp

1. **HIGH-INTERRUPTING CAPACITY** fuses limit fault current within ¼-cycle. Limitamp starters have short-circuit capacities up to 150,000 KVA at 2300 volts, and 250,000 KVA at 4000 or 4600 volts, 60 cycles.
2. **VISUAL CHECK** of three-phase isolating switch shows personnel that unit is isolated from high-voltage power.
3. **ISOLATING SWITCH** is operated from outside the enclosure. High-voltage compartment doors cannot be opened until starter has been isolated from incoming power.
4. **MOTOR IS PROTECTED** against overload by ambient-compensated overload relays. All Limitamp control components are co-ordinated to withstand the stresses of short circuits.
5. **METAL BARRIERS** separate the high-voltage and the low-voltage compartments.
6. **INTERLOCK SYSTEM** on this General Electric control prevents operation of the isolating switch until the contactor has been completely de-energized.

Write for bulletin GEA-6331 to Sect. 783-8, General Electric Co., Schenectady, N. Y.

FOR MORE INFORMATION AND APPLICATION ASSISTANCE on any of G.E.'s motor controls, contact your G-E Apparatus Sales Office.

LIFT

GENERAL ELECTRIC

A trainee taught u
some ABC

PLANT ENGIN

THE U. S. GOVERNMENT DOES NOT PAY FOR THIS ADVERTISEMENT. THE TREASURY DEPARTMENT THANKS, FOR

ght us
ABC's

At a briefing of trainees one of the boys asked: "Can I buy U. S. Savings Bonds through the Company and have my deductions made automatically?" Frankly we had assumed that all of our employees knew all about the Payroll Savings Plan.

As a matter of fact, we've had the Plan in operation here for years. We decided to make sure that *everyone* on our payroll got full information, right away.

Our State Savings Bond Director saw to it that we got a full stock of promotional material to stimulate interest in U. S. Savings Bonds. After that he helped us to conduct a personal canvass and give everyone an application blank.

What happened next was surprising. Our employee participation jumped to a really substantial percentage. When our people had all the facts they were glad to gain the security that U. S. Savings Bonds offer them.

Today there are more Payroll savers than ever before in peacetime. Your State Director will be happy to help you install a Payroll Savings Plan or build enrollment in one already existing. Look him up in the phone book or write: Savings Bonds Division, U. S. Treasury Dept., Washington, D. C.

go Poland

ENGINEERING

TMENT THANKS, FOR THEIR PATRIOTIC DONATION, THE ADVERTISING COUNCIL AND THE DONOR ABOVE.

Maintenance and Steam Traps

. . . there's a relationship that goes far beyond trap maintenance alone

Good traps and good trapping have a greater effect on your maintenance costs than does trap maintenance itself. By that we mean that the right traps, properly selected and installed, and with the benefits of a preventive maintenance program, will save far more maintenance dollars than they will cost.

Under the pressure of spiralling maintenance costs, this thought becomes mighty important. Let's take a look at what it involves:

Proper Selection of Steam Traps

1. Be sure it's the right type of trap.
2. Be sure it's sized right and is for the correct operating pressure.
3. Be sure it's first rate in design and construction.

Proper Installation of Steam Traps

1. Install them so they are accessible for inspection and maintenance.
2. Install a test valve.
3. Use a union or unions.
4. Use a shutoff valve or valves.
5. Use a strainer ahead of the trap if dirt conditions are bad.
6. Use a by-pass only where continuity of service is imperative.
7. Standardize inlet and outlet connections.

Preventive Maintenance Program

1. Test trap regularly for proper operation. (Trap size, operating pressure and importance determine frequency.)
2. Inspect internal mechanism at least once a year.

You Get Indirect Benefits As Well

The direct benefits of the plan outlined are pretty obvious — good traps, properly selected, require less maintenance . . . testing and inspection prevents troubles that lead to maintenance.

However, this plan provides indirect benefits which reduce maintenance in other parts of the plant as well:

Good traps save steam and reduce the load (and consequently maintenance) on fuel handling and burning equipment and on ash handling equipment.

Good traps protect the system by eliminating water hammer and preventing the damage it can do.

Good traps discharge carbon dioxide before it can go into solution to form corrosive carbonic acid — less corrosion, less maintenance.

Good traps increase production to reduce the length of time equipment must operate or reduce the amount of equipment needed . . . either way maintenance is reduced.

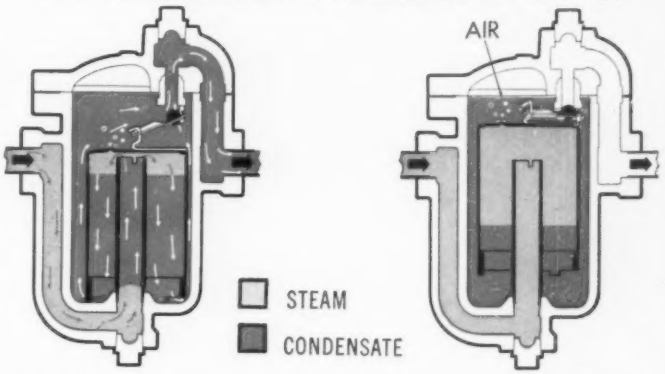
How to Go About It (The Sales Pitch)

We admit we're prejudiced, but we don't think there is any better way to select steam traps than with the help of the 44 page Armstrong Steam Trap Book. Here in a single source is specific data on the selection and sizing of traps, how to install them for best results, and how to maintain them most economically.

The Steam Trap Book will also give you full information on the design and construction of Armstrong Inverted Bucket Steam Traps that offer these important maintenance-reducing advantages:

1. Armstrong Traps are dependable.

HERE'S THE STEAM TRAP DESIGN THAT CAN REDUCE YOUR MAINTENANCE PROBLEMS



Trap open. Condensate entering trap has caused bucket to lose buoyancy. Weight of bucket times leverage pulls valve open. Air is discharged along with condensate.

Trap closed. Steam has floated inverted bucket; valve is held tightly closed by system pressure. Air entering trap passes through bucket vent and accumulates at top of trap.

2. Armstrong Traps require no adjustments — go from full load to zero load automatically.
3. Armstrong Traps are self-scrubbing—ordinary dirt conditions can't hurt them.
4. Armstrong Traps have long-life parts — valve and seat are heat treated chrome steel — lever assembly and bucket are stainless steel.
5. Armstrong Traps have water sealed valves to minimize wire drawing and erosion.

Ask for your copy of the Steam Trap Book—there is no obligation. Then test Armstrong Trapping. If you are not completely satisfied with the results, you can return the traps for a full refund of the purchase price. You can't lose much that way. Call your local Armstrong Representative or Distributor, or write

Armstrong Machine Works
9123 Maple Street
Three Rivers, Michigan

ARMSTRONG STEAM TRAPS

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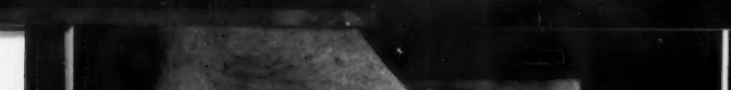
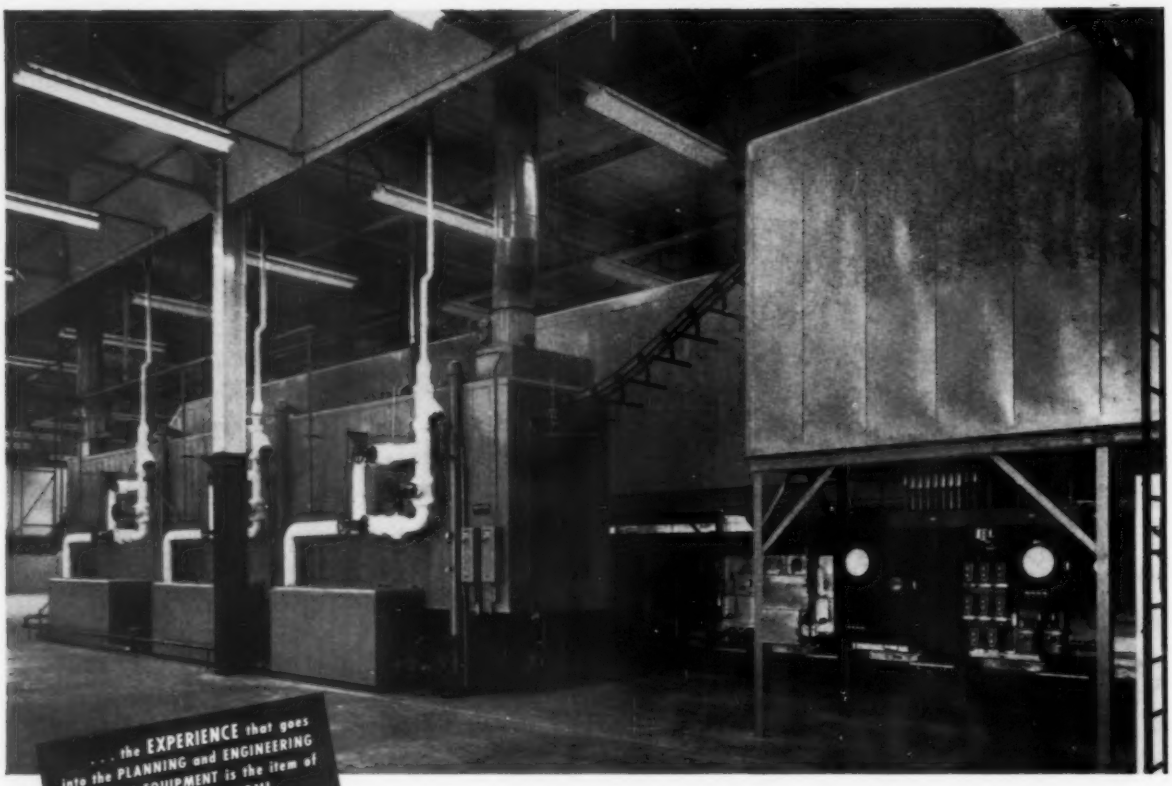


FINISHING SYSTEMS...



METAL OFFICE FURNITURE, Like Any Other Type of Metal Product You Could Name, is FINISHED in MAHON EQUIPMENT!

The modern finishing system pictured above was recently installed by Mahon in a plant of one of the major manufacturers of Metal Office Furniture.

When you have a finishing problem, or need new finishing equipment, you, too, will want to discuss methods, equipment requirements and possible production layouts with Mahon engineers . . . you'll find them better qualified to advise you, and better qualified to do the initial planning and engineering which is so vital to a properly coordinated production painting system.

THE R. C. MAHON COMPANY • Detroit 34, Michigan

SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Conveyorized Finishing Systems; Metal Parts Washers, Metal Cleaning and Rust Proofing Machines, Conveyorized Cleaning and Pickling Machines; Dry-Off Ovens, Cooling Tunnels, Spray Booths, Electrostatic Spray Enclosures, Flow Coaters, Dip Coaters, Finish Baking Ovens, and Paint Stripping Equipment; Core Ovens, Soldering Ovens, Heat Treating and Quenching Equipment for Aluminum and Magnesium; Dust and Fume Control Installations, and Many Other Units of Special Plant and Production Processing Equipment.

See Sweet's Plant Engineering File for Information and Representative Installations, or Write for Catalogue A-658

MAHON

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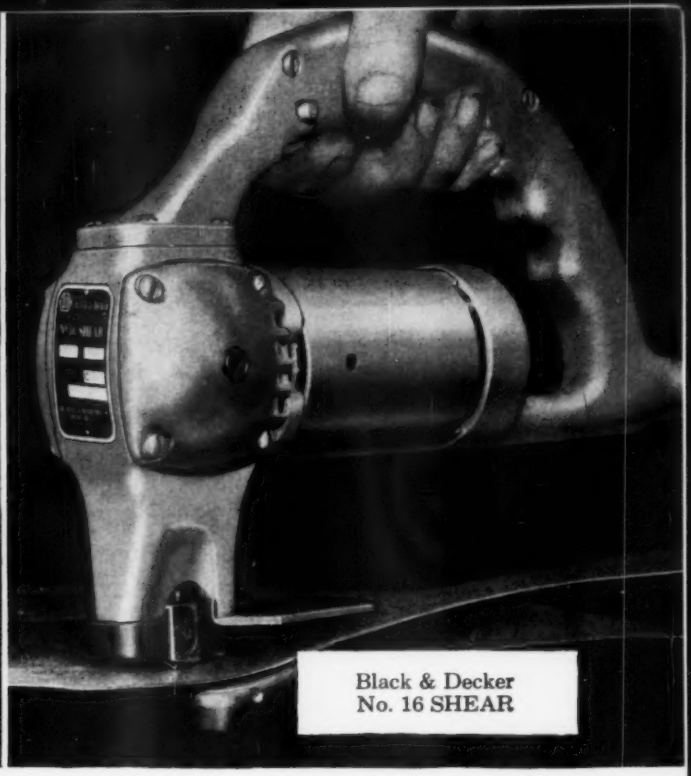
Black & Decker
No. 16 NIBBLER



Black & Decker
No. 16 SHEAR

Slash metal cutting costs with speedy B&D Tools!

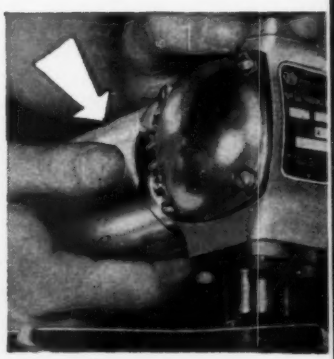
Faster, lighter, easier handling, POWER-BUILT and packed with features

Whether you need the speed of shears or the more precise performance of nibblers—you'll find a lot to like in the easy handling Black & Decker No. 16 Shear and No. 16 Nibbler.

By actual test, they're faster and longer-lived—dramatically cut costs. Their lighter weight means easier handling—centrifugal fans give cooler running. Each has exclusive construction features to stand up under the shock of sheet metal cutting.

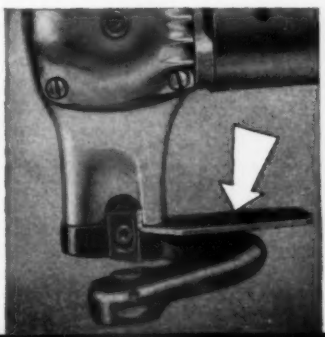
Try these new tools at your nearby Black & Decker distributor. There's a No. 12 Shear, too, for heavier work. For full details on new features, write to: THE BLACK & DECKER MFG. CO., Dept. 0808, Towson 4, Maryland. (In Canada: Brockville, Ontario.)

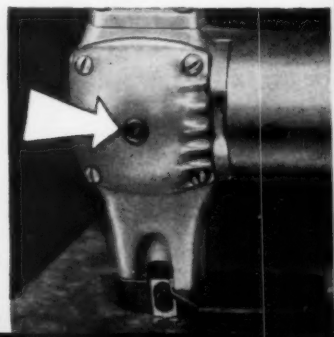
Look Under "TOOLS-ELECTRIC" in Yellow Pages



UP TO 3 TIMES FASTER than competition, new B&D Nibbler has twice the life, 20-30% less weight, reversible punch. Adjustable stripper plate (left), smaller diameter (right) are extra features.

50% FASTER than competition, new B&D Shear has one-third less weight than closest competitor, lasts much longer. Deflector plate prevents curling of material. Adjusting screw allows quick positioning of blade.





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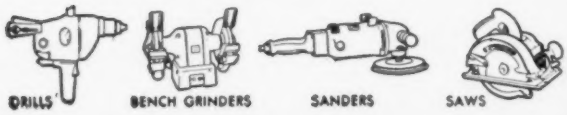
Black & Decker®

Portable Electric Tools—Power-Built to set the pace



DRILLS BENCH GRINDERS SANDERS SAWS

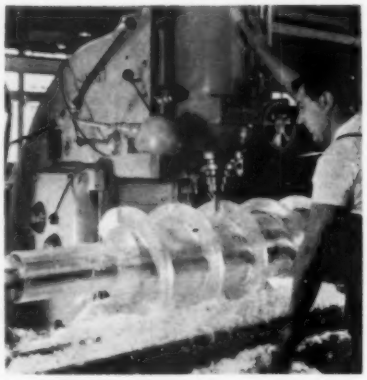
OPERATION AND PRODUCTION —pointers for the industrial plant engineer

Edited by Vern Kempf

Plastic Screw Resists Corrosion

MIXING and transporting viscous slurries requires the elimination of any metal or metal-alloy contamination. The Specialty Equipment Division of Chemineer, Inc., Dayton, Ohio, recently made a blender and feeder of Plexiglas acrylic plastic because it met all the chemical specifications, would easily withstand the mechanical operation, and could be machined to the close tolerances required.

Since Plexiglas does not come in stock thicknesses sufficient for an auger of the dimensions required, three-inch thick pieces were laminated to build up the required blank. The three-inch sheets were cut into discs a little larger than the required auger diameter. The flat surfaces of each disc were then machine-ground



Acrylic plastic auger is used to move corrosive, easily contaminated liquids

to insure exactly parallel surfaces.

The discs were then cemented together with a solvent cement until the desired length of approximately 50 in. had been attained. The cylinder was then bored and keyed for the insertion of a metal shaft. After the shaft was installed, the unit was turned on a milling machine by special gearing attached to the horizontal table. When the final assembly was made, the acrylic auger cleared its casing by exactly 0.010 in.

Packaged Boiler Saves $100 Day

INSTALLATION of a new oil-fired 500-hp packaged automatic boiler is saving the Reliable Dyeing & Finishing Co., Inc., Paterson, N. J., about $100 per day. The company dyes, bleaches and finishes textiles. Steam is used to heat the solutions and to dry and finish the dyed fabrics. Most of the equipment requires steam at 120 psi.

Prior to the installation of the

(Continued on page 62)

Smooth Control System Improves Production Line Casting

HOW DO YOU control a 1200-rpm motor, geared down to 0.24 rpm, rotating a 25-ton wheel 25 ft in diameter? The drive must accelerate from zero to top speed in 10 to 25 seconds and decelerate at the same rate and must do this job smoothly without any jerking in starting or stopping.

This unusual control problem arose in the casting of molten copper into anodes at the Inspiration Consolidated Copper Company, Inspiration, Arizona. In the process, 10 equally spaced molds are mounted on the wheel's periphery. During a complete revolution, a mold is filled with molten copper that solidifies to form the anode, the anode is removed and the mold is reconditioned to receive the molten copper again.

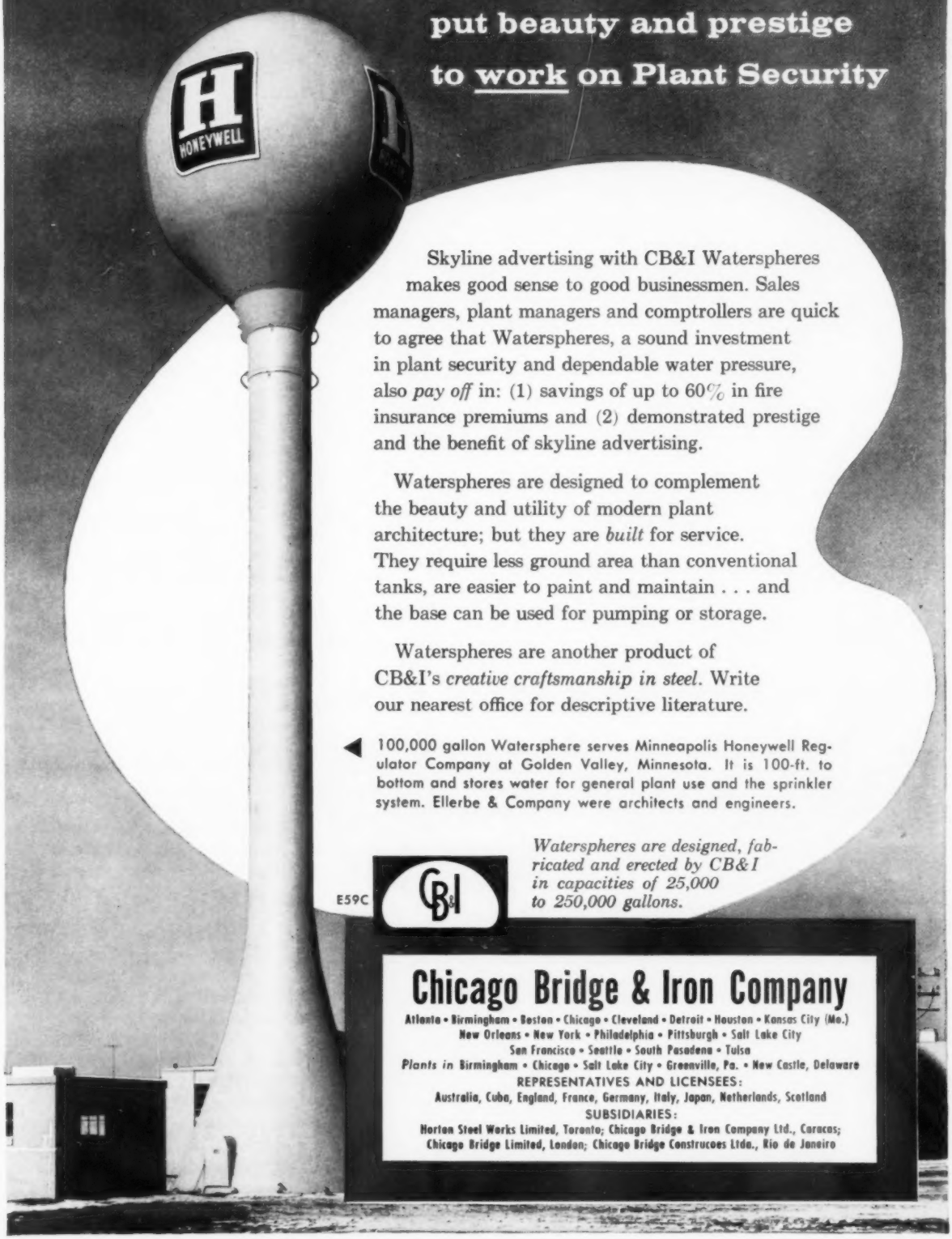
A complete cycle from start to stop takes 1½ min. on this rotating casting table

In the process of casting, all starting, stopping, acceleration and deceleration must be very smooth. Jerking or sloshing will disturb the crystal structure of the cooling copper and cause problems in the electrolytic process that follows.

The problem was solved by using a Westinghouse Magamp control with a rate-of-change feedback to control the system's generator field current. In the control cycle, the wheel runs at 0.24 rpm after acceleration until a limit switch initiates the slowdown. Rate of slowdown to 0.024 rpm is adjustable and may take from 10 to 25 seconds. The wheel runs at this slow speed until another limit switch applies a suicide field to the generator to bring the wheel to a complete stop.

WATERSPHERES®

put beauty and prestige to work on Plant Security



Skyline advertising with CB&I Waterspheres makes good sense to good businessmen. Sales managers, plant managers and comptrollers are quick to agree that Waterspheres, a sound investment in plant security and dependable water pressure, also *pay off* in: (1) savings of up to 60% in fire insurance premiums and (2) demonstrated prestige and the benefit of skyline advertising.

Waterspheres are designed to complement the beauty and utility of modern plant architecture; but they are *built* for service. They require less ground area than conventional tanks, are easier to paint and maintain . . . and the base can be used for pumping or storage.

Waterspheres are another product of CB&I's *creative craftsmanship in steel.* Write our nearest office for descriptive literature.

◀ 100,000 gallon Watersphere serves Minneapolis Honeywell Regulator Company at Golden Valley, Minnesota. It is 100-ft. to bottom and stores water for general plant use and the sprinkler system. Ellerbe & Company were architects and engineers.

Waterspheres are designed, fabricated and erected by CB&I in capacities of 25,000 to 250,000 gallons.

E59C

CB&I

Chicago Bridge & Iron Company

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Chicago Bridge Limited, London; Chicago Bridge Construcoes Ltda., Rio de Janeiro

For more facts circle 547 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 60)

new boiler, the variable demand was being met by three 150-hp boilers. One was hand-fired with bituminous coal and two were fired with No. 6 fuel oil under manual control. Of the oil-burning units, one was 43 years old and had defective brickwork. The brick stack serving both boilers was also in need of repair.

Was it worth the investment of several thousand dollars to keep the two obsolete boilers in service? Even if the brickwork and stack were repaired, this would only restore the old boilers to operating condition. It would not assure an efficient operation.

It was felt that this money could more profitably be applied to a new, larger boiler that could carry the entire plant load. After some discussion, it was decided to abandon the old boilers and install a 500-hp York-Shipley packaged boiler.

Despite its greatly increased horsepower rating, the new boiler fits into the floor space formerly occupied by one of the old 150-hp units. No floor pit, brickwork or high stack was required and the new boiler included a blower to provide the exact amount of air needed for efficient combustion. Hand-firing was eliminated and now the boiler room personnel only make regular inspections and perform scheduled maintenance.

The new boiler shuts itself off every night at 9 p. m. This automatic operation has put an end to the night shift. Where four men were formerly required by the boiler room, only two are needed now.

Magnets Detect Hammermill Wear

MAGNETIC separators are used to detect hammermill wear at the Gibsonburg Lime Products Company, Gibsonburg, Ohio. In addition to their primary function of removing tramp iron and iron fines from lime being processed, the magnets also furnish a tip-off when the hammermills require a new set of hammers.

Tramp iron or iron filings removed by the Eriez magnets is normally quite constant. When there is a sudden rise in accumulations of fine iron on the magnets, it is an indication that the hard-surfacing on the hammers has worn through and the body of the hammer is beginning to abrade. Hammers are promptly changed, with the result that potential trouble is avoided.

Pulley does double duty removing iron and checking hammermill wear

Do-It-Yourself Rack Is Cheap, Quick

LOW COST, vertical bar storage racks are being constructed by the maintenance department of the Ai-Research Manufacturing Company, Los Angeles, California. The racks

(Continued on page 64)

Submerged Arc Welding Gun Doubles Welding Speed

APPLICATION of submerged arc welding to joints that would formerly have been manually welded has doubled welding speeds at the Paterson-Leitch Company, Cleveland, Ohio. The unit is used in parts of a large flue system.

Completely automatic in operation, the Lincoln unit welds through a gun that is manually guided by the operator. A 15-ft cable connects the gun to the machine. A small variable speed motor, mounted on the gun, propels it over the work at any speed between 0 and 70 in. per minute. Mounted on the welder is a continuous flux supply with a 100 lb capacity reservoir.

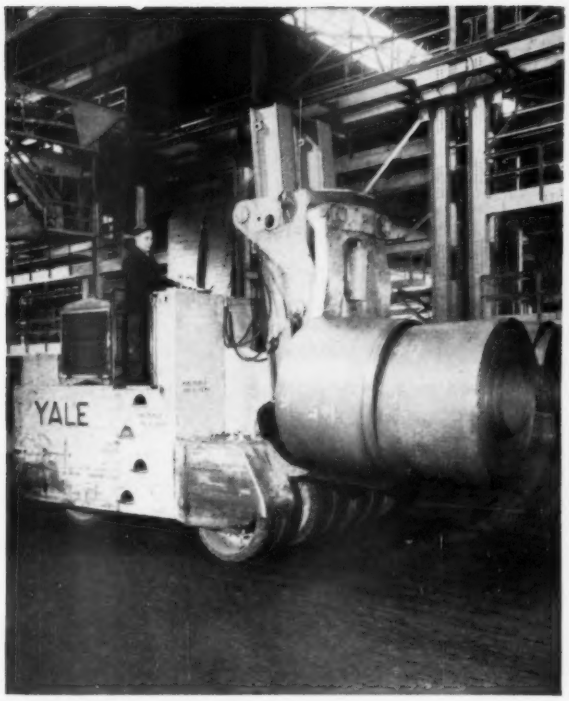
Fully automatic in operation, the operators only task is to guide gun along a line

A wire feed motor on the welder pushes continuous $\frac{5}{64}$ or $\frac{3}{32}$ in. bare electrode through the cable to the gun. The electrode feed rate is automatically controlled to maintain any preset arc length. Welding currents, applied to the electrode at the gun, are 500 amperes or more.

As the arc is buried under the flux, no helmet is required and the operator concentrates on guiding the gun along the joint and lets the travel motor carry it. In addition to the increased welding speed, the equipment also produces an improved bead appearance and uniform quality.

B.F.Goodrich

Pneumatic tires?



Solid tires?

Which industrial tires are right for your job?

Free B.F.Goodrich TW Analysis tells you

Can save you as much as 50% on tire costs!

Problem: There are many different industrial tire types, sizes, tread compounds and tread designs. Each one is built for a specific materials handling job. Do you know which tires are right for *your* job?

Solution: Without cost or obligation your B.F.Goodrich Tire and Wheel Analysis man will study your equipment, loads, hauling surfaces and other special problems you have. He'll recommend the right tires for you to use—recommendations that are unbiased because B.F.Goodrich makes a *complete* line of industrial tires.

Result: You can save as much as 50% on industrial tire costs, as much as 20% on maintenance costs. Mail the coupon today for your FREE B.F.Goodrich TW Analysis.

A special consulting service is available to manufacturers of materials handling equipment.

Specify B.F.Goodrich tires when ordering new equipment

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I would like further information on your FREE TW Analysis.

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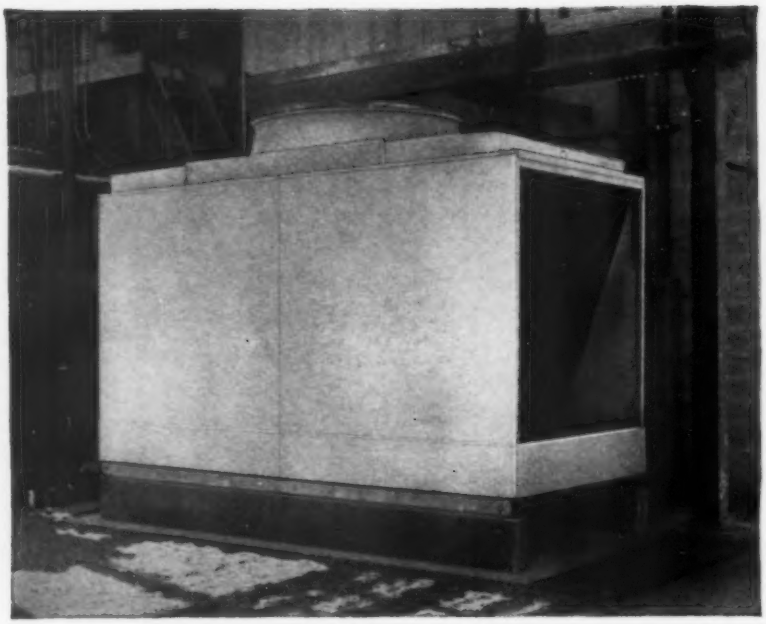


Industry finds that the "P.A.Q." COOLING TOWER pays for itself p.d.q. . . .

MARLEY'S PACKAGED DOUBLE-FLOW AQUATOWER* can quickly turn waste into *profit* if there's a place in your plant where water is being used at the rate of 200-400 gpm—for process cooling, for air conditioning, for refrigeration, for humidification, or other plant services.

The "P.A.Q." is low in intial cost, and soon pays for itself many times over by saving more than 95% of the water now wasted. It is designed to go on the job quicker, stay on the job longer, and turn in a better performance than any other packaged product. Installation couldn't be more economical, for the Packaged Double-Flow Aquatower is shipped assembled (simply hoist it . . . pipe it . . . wire it . . . and it's in service!). Piping is simple and economical, for the tower's compact design and low-silhouette permit location near the equipment to be cooled.

The Packaged Double-Flow Aquatower is just a part of the complete Marley line of packaged and custom-designed towers that are saving millions of down-the-drain dollars for industry. For information on Marley towers, contact your Marley Sales Engineer in 56 cities, or write today.

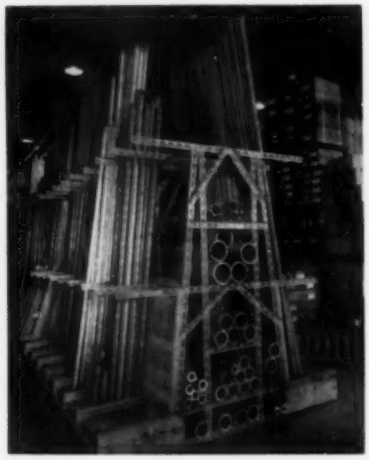
MARLEY **The Marley Company**
Kansas City, Missouri

*Registered Trademark

For more facts circle 549 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 60)



Do-it-yourself rack assembles fast at low cost, provides more efficient sorting

are used to provide storage space for varying diameters of aluminum pipe and permit both vertical and horizontal storage.

Made of 225-80 slotted angle, manufactured by Acme Steel Company, Chicago, Ill., a typical rack is 12 ft long, 6 ft wide, and 8 ft high and is strong enough to hold 2000 lb of material in each section.

Slotted angle is a galvanized, cold-rolled steel angle made with a series of slots and holes to permit simple cut and bolt assembly. Structures can be erected easily without the use of special tools.

A typical rack is constructed by three men working a total of 24 man-hours. Seven hundred and fifty feet of slotted angle are used at a total cost of $257.85. The total cost of the slotted angle rack represents average savings of approximately 40 per cent over other materials that were considered.

Control Stops Acid Overflow

RELIABILITY in level control equipment is very important when it is used to control nitric acid used in pickling operations. The Cold Draw Department of International Nickel Company's Huntington, W. Va., works is using a Magnetrol liquid level control for this critical application.

Installed four years ago, the liquid level control is used to provide safe-

Heat with...
Gas? Steam? or Hot Water?

Westinghouse has the exact Unit Heater for the job

GAS-FIRED *NEW MODEL*

fast delivery from local stock!

the right Btuh...the right mounting...the right distribution pattern

IDEAL FOR HEATING:

- **Garages**
- **Department Stores**
- **Bowling Alleys**
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You'll think Westinghouse custom-made this Unit Heater just to meet *your* space heating requirements . . . and they can be bought right off the shelf.

Gas-Fired Unit Heaters
Sizes from 25,000 to 250,000 Btuh

Steam and Hot Water Applications
Sizes from 265 to 11,500 CFM—15,000 to 684,000 Btuh—65 to 2850 EDR

Attractive Cabinet Models
Sizes from 300 to 2070 CFM—110 to 525 EDR

J-80670

Call your Sturtevant Division Sales Engineer or write:

WESTINGHOUSE ELECTRIC CORPORATION, DEPT. H-9, HYDE PARK, BOSTON 36, MASSACHUSETTS

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10,000 pounds to 60,000 pounds of quality steam per hour

TITUSVILLE BOILERS SINCE 1860

TYPE WTP PACKAGED STEAM GENERATOR

Write for your copy of new Bulletin B-3255

The Titusville WTP Steam Generator's ease of installation and simplicity of operation are matched by the economy and dependability in operation that make this water-tube unit a standout in value year after year! Completely shop-assembled, requiring no special foundations, high stack or induced draft fan, the Titusville WTP is ready to serve you the moment service connections are made. *Let us discuss your needs.*

THE TITUSVILLE IRON WORKS CO.

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TITUSVILLE, PENNSYLVANIA

Manufacturers of A Complete Line of Boilers for Every Heating and Power Requirement

Plants at Titusville, Pa. and Warren, Pa.

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BOILERS for Power and Heat . . . High and Low Pressure . . . Water Tube . . . Fire Tube . . . Package Units

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OPERATION—PRODUCTION

(O and P begins on page 60)

ty in the filling of a nitric acid measuring tank. The acid is delivered under pressure from a storage tank located some distance away.

An operator manually controls the filling, watching a prismatic gage glass. The level control steps in to shut off the flow automatically, if the acid level should get too high. Safety in the acid-filling operation can only be assured if the control mechanism is simple and will operate without constant maintenance.

Simple Leak Tester Saves Time

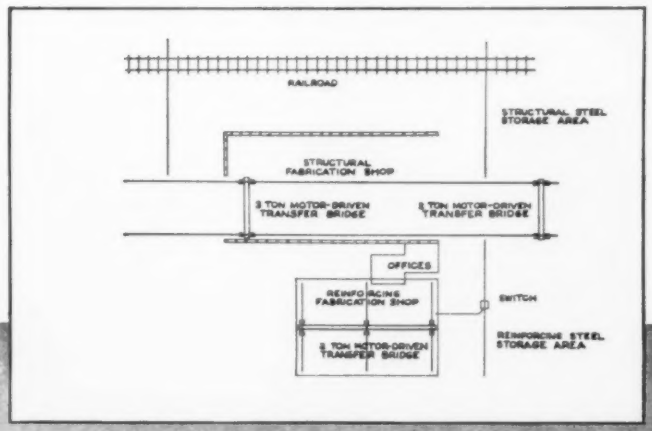
Visual inspection is used by Rockwell Manufacturing Company to check liquefied petroleum gas meters for leakage. Air lines, clamped to the meter, keep internal meter pressure at twice normal working pressure. Water enters the tank and operator checks for bubbles

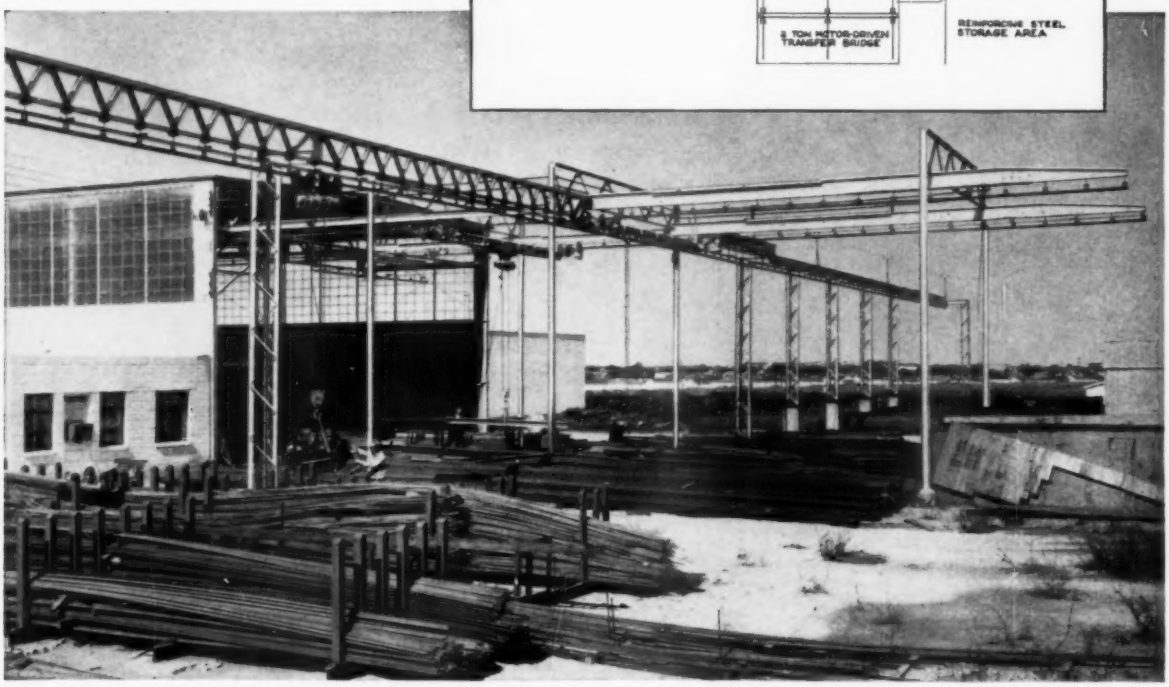
Sampler Improves Quality Control

AUTOMATIC coal samplers, fabricated and engineered by Sturtevant Mill Company, Boston, Mass., are used for crushing and sampling sodium tripolyphosphates at the Westvaco Mineral Products Division of Food Machinery and Chemical Corporation, Carteret, New Jersey. Initially developed for the mining and power industries, the machinery has worked successfully for six years with no downtime or parts replacement. The only maintenance required on the units has been routine

"Inside-outside" Tramrail System
BOOSTS STRUCTURAL SHOP PRODUCTION 66%

Although Thornton Steel Co. is an important steel fabricator and could readily make equipment to handle its materials, it has installed Cleveland Tramrail throughout its yard and plant because it recognizes the importance and advantages of materials handling equipment especially designed and built for the purpose.





MAN-HOURS required for fabrication of trusses and various steel work for buildings were cut an average of 40% with a Cleveland Tramrail system by Thornton Steel Co., Fort Worth, Texas.

Thus, without expanding the plant structure, or adding to fabricating machinery or working force, production was stepped up 66%.

Being situated in a part of Texas where winters are not severe, much of the work is carried on out-of-doors. Tramrail transfer cranes and carriers serve both inside and outside the plant. This enables delivering materials from various parts of the yard to any part of the shop without rehandling. Thus materials are moved fast and efficiently in the least possible time.

WRITE FOR FREE COPY of Engineering and Data Booklet No. 2008. Packed with valuable information. Profusely illustrated.

CLEVELAND TRAMRAIL

Overhead Materials Handling Equipment

CLEVELAND TRAMRAIL DIVISION • THE CLEVELAND CRANE & ENGINEERING CO. • 7526 E. 290 ST. • WICKLIFFE, OHIO

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. . . with a *foster* system that's custom engineered to your needs.

Your insulations . . . all types . . . can last the life of the equipment . . . provided they are properly protected. Thermal insulation failures and resulting loss in equipment operating time can be prevented when you follow a Foster system for complete protection.

Now, for the first time in the thermal insulation field, here is a series of bulletins clearly outlining and giving the solution to every known problem in the protection and preventive maintenance of hot and cold insulations on piping, ducts, vessels and other equipment.

A card, letter or phone call to Foster will bring you the appropriate bulletin describing and recommending the correct use of mastics, adhesives, coatings and flashing compounds. No matter how unusual your insulation protection problem may be, your local Foster sales engineer will be glad to work with you in developing an efficient, economical protection system.

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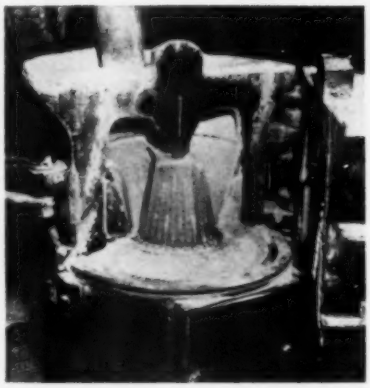
OPERATION—PRODUCTION

(O and P begins on page 60)



Inspection of crushing nut and liners is simplified by the split cover design

maintenance such as cleaning and lubrication.

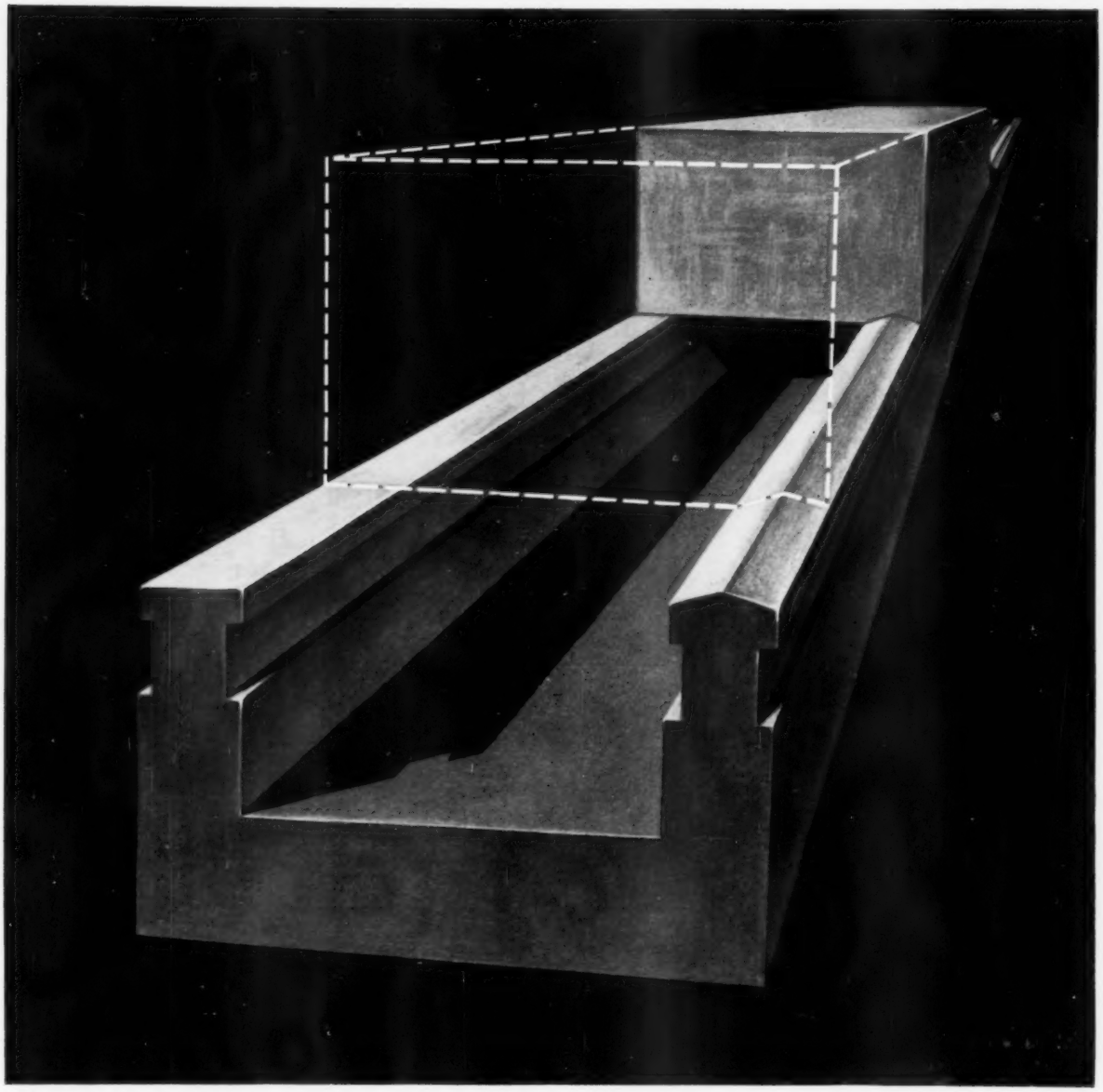
Phosphates are fed into a hopper where they are gripped by a revolving coarse crushing nut and are roughly crushed against the top of the liners. They are then passed to a revolving, fine-toothed crushing disc and stationary liner where the crushing operation is completed.

A handwheel adjustment at the lower body of the unit allows adjustment for fine or coarse grinding. The fine grinding adjustment is used to assure the minute particles required for lab analysis.

Air Conditioning Stops Rust

COMPLETELY air conditioned, the new Penco Metal Products Division Manufacturing center at Oaks, Pennsylvania, is using pinpoint humidity control to effect substantial

Units mounted above crane rail control humidity to stop rusting of steel stock



for smooth, steady sliding way action

Febis K lubricants – specially formulated to prevent the irregular, stick-slip motion of slow-speed sliding ways in machine tools – are equally effective in higher speed operations. The special composition of Febis K lubricants gives them the unusual property of providing lower *static* friction than *sliding* friction. As a result, moving parts, starting with a low force, will not jump ahead. Febis K lubricants provide smooth, steady sliding action...assure better precision work. Febis K lubricants also help reduce wear because of their strong adhesion to sliding surfaces. And they have mild EP and rust-preventive properties. Febis K lubricants are available in *two* grades: *Febis K-53* for small- and medium-size machines, and *Febis K-73* for heavy machines. Both Febis K lubricants have passed the Cincinnati Milling Machine Company's stick-slip test and have been checked and approved by the Bijur Lubricating Corp. for use in their automatic lubrication systems. For further information, contact your nearest Esso office in New England, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, West Virginia, the Carolinas, Tennessee, Arkansas, Louisiana, and the District of Columbia. Or *write* Esso Standard Oil Company, 15 West 51st Street, New York 19, N. Y.

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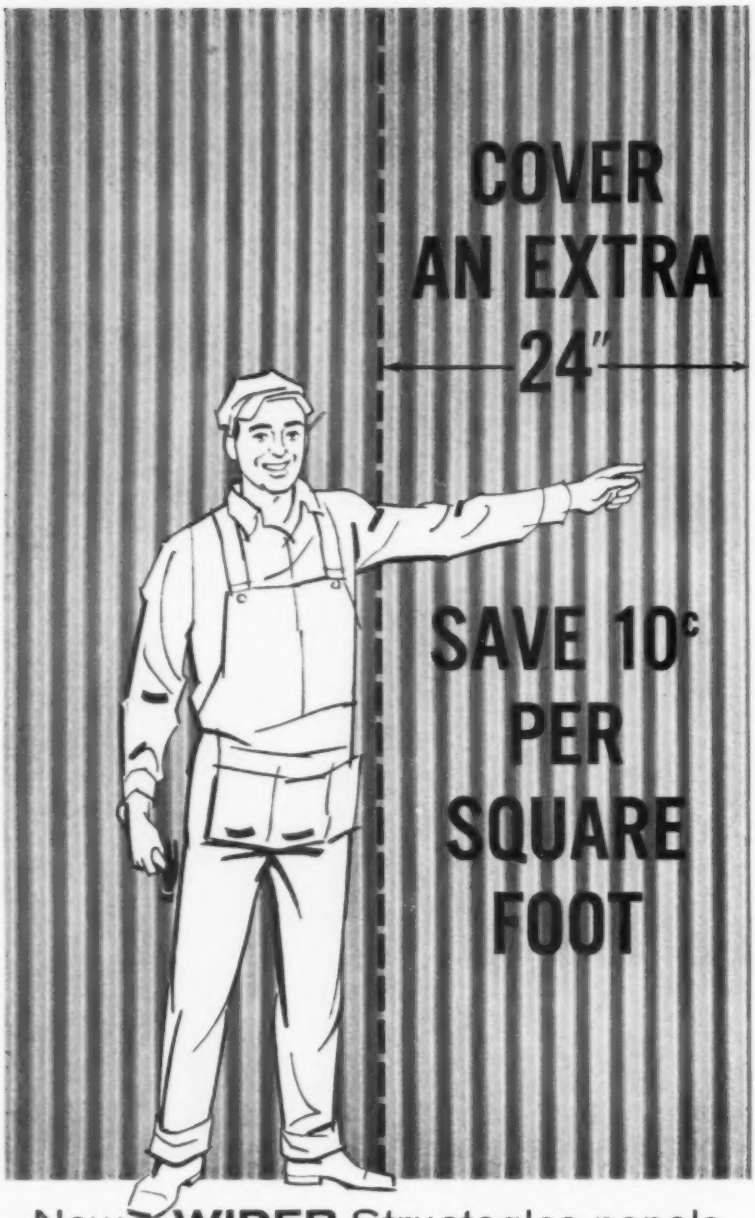


New **WIDER** Structoglas panels save labor, waste and money

Don't buy *any* fiber glass panels until you get a quote on new *wider* Structoglas corrugated. Two new widths (51½" for skylights, 50" for glazing, both covering 48") give you more installed coverage area per dollar than any other panel. Wider Structoglas has fewer overlaps, needs less fasteners, takes less time to install. You actually save 10c per square foot when you install 51½" Structoglas instead of ordinary 27½" panels.

Specify Structoglas–the reinforced plastic panels that eliminate glass breakage, transmit diffused natural light.

structoglas®

Write for specs and prices to
STRUCTOGLAS DIVISION
International Molded Plastics, Inc.
Dept. PE8, Cleveland 9, Ohio

5809

For more facts circle 555 on Reply Card

OPERATION—PRODUCTION

(O and P begins on page 60)

economies in stock steel storage. In the past, the company was forced to paint its steel stock immediately after it was formed.

Now, with the storage area controlled with Trane air conditioning units at 35 per cent humidity, the raw steel parts can be stocked indefinitely. Parts are painted in the color desired prior to shipment. This reduces scratching of finished parts that were previously painted and then stocked.

Oxide Cuts Hard Steel

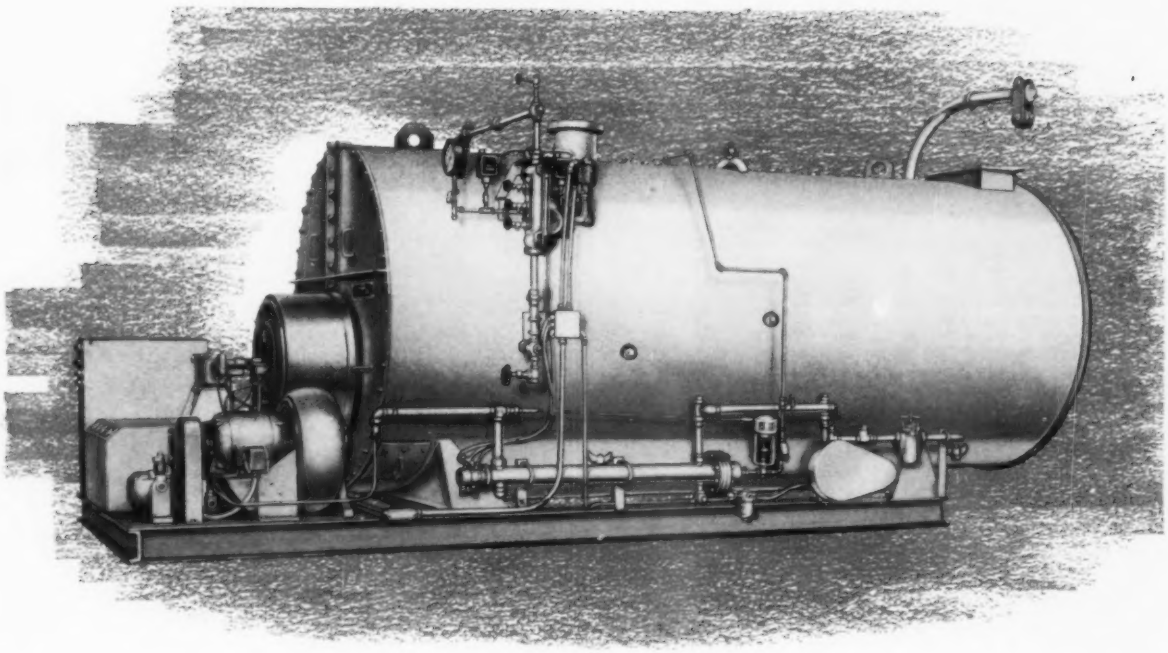
HARDENED punches and rings, 58-59 Rockwell C, were machined with grade 0-30 cemented oxide at the Formax Manufacturing Company, Detroit, Michigan, with savings over conventional methods totaling some $1500.

Previously, the punches and rings were annealed, turned, rehardened and ground to finish size. With the cemented oxide cutters the parts are machined at 250-375 rpm, 125-135 sfpm. Feed is set for 0.0035 and depth of cut 0.010 resulting in a final finish of 36-46 microinches.

Part diameters ranged from one inch to two and one half inches and necessitated removing ⅛ in. of hardened stock with 0.003 in. left for grinding. Grade 0-30 cemented oxide is manufactured and stocked by Metallurgical Products Department of General Electric Company, Detroit, Michigan.

Cemented oxide machines this 58-59 Rockwell C die ring. Note tool holder

For more facts circle 540 on Reply Card ⟶



You can't buy them.....

Better Designed

Behind this Erie City "FT" package unit is the manufacturing skill and engineering know-how acquired through more than a century of producing large, high pressure, water tube and fire tube industrial power boilers.

The "FT" has five full square feet of heating surface (ASME basis) per developed horsepower. The 3-pass design places the gas vent at the rear where it belongs. Carefully proportioned gas areas through three lengths of the boiler take into consideration reduced gas volume as heat is being rapidly absorbed by the surrounding water. The "FT" is a pressurized unit using forced draft to provide precise control of excess air and CO_2 — no leakage of outside air into the combustion chamber is going to lower the efficiency.

Better Built

The same modern shop practices and quality workmanship used on our largest power boilers are used on these package fire tube steam generators. Every "FT" is of welded construction, stress relieved and X-rayed as part of the quality built into this unit. The "FT" is built for easy installation and complete accessibility. A full length, rigid, all welded structural steel base carries the entire package unit, permitting quick and easy installation anywhere without the use of skids and without excavation or foundation work. The front and rear heads are constructed of insulated, sectional panels for complete accessibility to the tubes and combustion chambers.

Every Erie City "FT" is built to highest quality — not down to a price.

Better Serviced

Every "FT" is designed, built, assembled, piped, wired and *Factory Fire Tested* by Erie City Iron Works. A complete package steam generator ready to go to work when it reaches the customer's plant.

A *factory trained* Erie City field service engineer will supervise the initial start-up and will instruct the operating personnel in the proper operation of the unit. This feature of using *factory trained* service engineers plus *Factory Fire Testing* results in a correctly adjusted, efficient steam generator.

Investigate all the advantages of the Erie City "FT" package fire tube. Catalog literature is available and an Erie City District Sales Agent will be pleased to show you an "FT" in operation.

For the quality fire tube package "FT" — write for Catalog 5683-H

• *You can depend on* ERIE CITY Since 1840 *for sound engineering*

ERIE CITY IRON WORKS • *Erie, Pennsylvania*

STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS • WASTE HEAT BOILERS
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Huge 96" Acid Fume Fan—210,000 cfm "Buffalo" Axial Flow Fan with cast aluminum wheel, installed in a textile mill.

In Stack Hood Exhaust — Easy installation is a big advantage of the duct-size "Buffalo" Axials mounted in these stacks. Hoods give all-weather protection.

FOR TOP AXIAL FLOW FAN EFFICIENCY— IN BIG JOBS OR SMALL—

SPECIFY "BUFFALO" AXIALS

"Buffalo" Axial Flow Fans provide extremely quiet and efficient performance. This inherent efficiency is further improved by the "Buffalo" Vaneaxial outlet guide vanes. These carefully engineered vanes re-direct the swirling air at the fan outlet, converting it into increased forward thrust.

These sturdy, reliable fans are light in weight, permitting easy installation. Except for the largest models, no structural support or heavy foundation are required. "Buffalo" Axials can be installed as a section of the duct or stack in hood and other roof exhaust systems.

Duct-size "Buffalo" Axials save space by fitting in close to walls or ceilings. Space-saving installations include service as ventilation, exhaust and industrial air conditioning supply fans. They are widely used for applications ranging from paint spray booth exhaust to boiler room cooling.

"Buffalo" Axial Flow Fans are available for high or low temperatures, corrosive fumes, explosive atmospheres and other severe conditions.

Investigate the many advantages offered by "Buffalo" Axial Flow Fans. Contact your nearby "Buffalo" engineering representative, or write direct for Bulletin 3533-EF.

"Buffalo"

BUFFALO FORGE COMPANY

166 Mortimer St. • Buffalo, N. Y.

Buffalo Pumps Division • Buffalo, N. Y.

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING
FORCED DRAFT COOLING HEATING PRESSURE BLOWING

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These 5 "tips" can help you end sump pumping problems *once and for all*

Here are 5 ways to prevent sump pumping trouble before it starts *and* cut maintenance time—with Goulds Fig. 3171 vertical centrifugal sump pump.

1. Put the pump at the proper depth without paying the extra cost for special shaft lengths and pipe columns. Goulds Fig. 3171 fits any pit from 2 to 20 feet deep—comes in standard lengths of 6 inch increments.

2. Maintain pump alignment permanently by means of male and female fits on Goulds Fig. 3171.

3. Prevent damage by fumes, weather, moisture with these features of the Fig. 3171: completely sealed-in upper bearing; Falk all-steel couplings; special vapor-proof construction (upon request).

4. Make external adjustments for impeller clearance with Goulds Fig. 3171—to save time, trouble. Replace upper bearings without disturbing pump or piping merely by removing the motor and coupling from above.

5. Adapt to changing pit depths without ordering a whole new unit. You can adapt this pump *in the field* for new depth or pump ratings simply by ordering a few new parts.

You can get Goulds Fig. 3171 as a single or duplex unit—completely assembled with sump cover—for wet or dry pits, with capacities to 1080 GPM, heads to 290 ft. For more details, contact your Goulds dealer, or write for your copy of Bulletin 726.2.

GOULDS PUMPS, INC.

Dept. PE-88 Seneca Falls, N. Y.

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...PLUS COMPLETE LINES OF JOB TAILORED PRODUCTS TO KEEP YOUR

AIRCRAFT PLASTIC CLEANER positively will not craze, mar or gouge the most delicate plastic canopy finishes. Leaves anti-static film. Complies to Mil-C-18767 (ASG).

VALVE GRINDING COMPOUND is water mixed or grease mixed. Special grit becomes finer as work progresses.

NON-DRYING PRUSSIAN BLUE locates high spots and helps prevent burned bearings, jammed shafts, etc.

GLASS SEALER sets up tough, pliable, waterproof bond between glass, metal, rubber or other materials. Colorless liquid.

WATER SEALER (LIQUID) sets up hard, flexible, permanent seal at leak site in radiators, pump connections, and water jackets. Compatible with all anti-freezes.

HYDRAULIC JACK OIL is a neutral formula that won't creep, evaporate, or corrode. Approved for all jacks and many other hydraulic systems.

PENETRATING OIL is an effective mixture of solvents, penetrants, lubricants and corrosion inhibitors.

PERMATEX TOON-OYL® is crankcase and fuel line additive. Removes carbon, gum, varnish, frees valves, inhibits acid formation, prevents scored cylinders and bearings.

IN MAINTENANCE CHEMICALS CAN SOLVE ALL YOUR INDUSTRIAL SEALING PROBLEMS

Sealing can be made easy. With Permatex sealants you are ready for every emergency as well as routine maintenance. Ready with the best . . . job-tailored by engineers who know and anticipate industry's needs. For help in unusual sealing situations, ask the Permatex experts. Sealing is our business.

FORM-A-GASKET No. 1 dries quickly, sets hard. For irregular surfaces, permanent assemblies that must withstand high pressure and heat.

FORM-A-GASKET No. 2 dries slowly; remains pliable. Paste for general assembly work where periodic disassembly is necessary. Vibration resistant.

FORM-A-GASKET No. 3 is a brushable liquid that remains pliable for easy disassembly. Ideal for reaching hard-to-get-at areas.

GASKET CEMENT is extra-heavy, dries hard, resists gasoline and oil, for permanent assemblies where no adjustments or disassemblies are necessary.

STICK-N-SEAL is made of synthetic rubber, resists gasoline, lubricating oils, water, glycol, kerosene. No "delayed reaction" leaks.

PIPE JOINT COMPOUND is semi-liquid seal for water, steam, illuminating gas, fuel oils, kerosene and lubricating oils. Perfect for brush application.

SUPER "300" FORM-A-GASKET is diester resistant, resists "washing" of oil additives. Increased resistance to chemicals that affect other sealants.

EQUIPMENT PRODUCING FASTER, MORE SAFELY, WITH LESS DOWNTIME

SOLVO-RUST loosens frozen parts. Safe on all metals. Contains no harmful acids, ether or kerosene. Compounded with grapholeum.

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HYDRAULIC BRAKE FLUID is exceptionally fine for all units used under extreme conditions. Maximum protection.

AUTOMATIC TRANSMISSION FLUID is top quality. Mixes with original and other replacement fluids. Correct viscosity from −40 F to 300 F. Won't foam.

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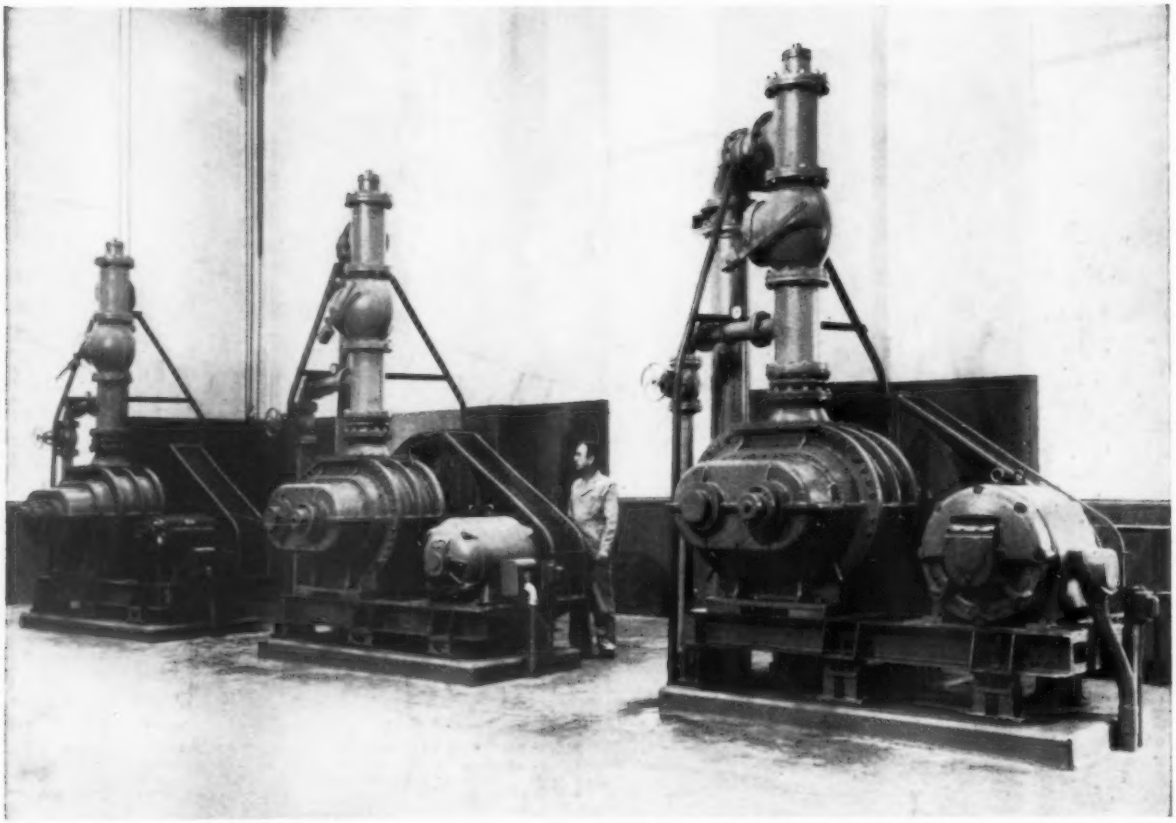

These three 18 x 18 heavy duty Sutorbilt blowers operate at 350 rpm, deliver 2400 cfm against 7 psig . . . operate continuously for many, trouble-free years. San Jose Sewage Treatment Plant.

SUTORBILT BLOWERS MINIMIZE AIR CONTAMINATION

You can depend on Sutorbilt Positive-Pressure Blowers and Gas Pumps to deliver clean, dry air or gas for many years, without costly maintenance and loss in efficiency. Reasons include precision-machined, wide-face herringbone gears, extra-rugged exclusive Sutorbilt timing hub, heavy-duty anti-friction roller bearings . . . closely-held tolerances throughout. Grease and oil seals, or in some instances, a five ring packing gland, insure integrity of air seal where shaft passes through the blower headplate.

Write for illustrated brochure giving complete specifications.

Representatives located in principal cities. Consult your classified telephone directory.

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SUTORBILT IS WELL BUILT

SUTORBILT CORPORATION, 2966 East Victoria St. • Compton, Calif.

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ROTARY POSITIVE-PRESSURE BLOWERS AND GAS PUMPS WITH VERTICAL OR HORIZONTAL MOUNTING

1164
5-11

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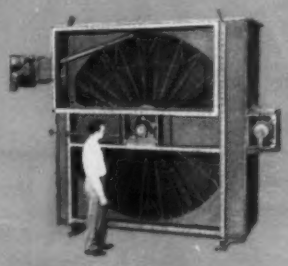
Here's what you can do about the high cost of fuel



Get the same heat from less fuel with a

Ljungstrom® Package Air Preheater

A significant amount of your fuel is used to heat the combustion *air* in your boilers. A Package Ljungstrom Air Preheater raises the temperature of combustion air by recovering the heat from the exhaust gas. In preheated air, the fuel you are now using will burn more completely, and much more of it will be *productive* heat.

Here is an example of what this means in dollar savings. In one year (1956) a typical Package Ljungstrom installation saved $17,600 in fuel costs. In some installations the Package Ljungstrom saved enough fuel to pay for itself in two years.

Compact Package design of the Ljungstrom gives you all the advantages and economies of the Ljungstrom in a preassembled unit. The Package Ljungstrom is available in vertical or horizontal models that are readily adaptable to any plant arrangement.

For further information, write today for the free 14-page Package Ljungstrom manual.

THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N.Y.

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Eliminate high-cost accidents with low-cost A.W. Super-Diamond. A.W. Super-Diamond safety floor plate replaces DANGER with SAFETY wherever hazardous slipping conditions occur. Here's why!

- Raised steel, diamond-shaped figures give *maximum slip-skid resistance from all angles of approach.*
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- Non-directional pattern—no matching problems—minimum waste.
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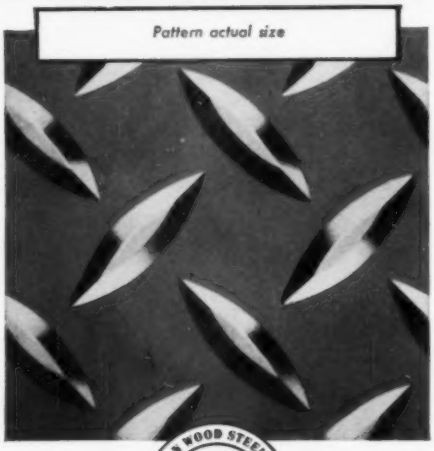
- Use as independent flooring or flooring overlay.

Get complete . . . free . . . information that may save you thousands! Write today on your company letterhead to Dept. SD-E9.

Pattern actual size



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A.W. SUPER-DIAMOND

ROLLED STEEL FLOOR PLATE

Wherever oil, grease, or other substances raise special slipping accident hazards, we suggest a check on the special non-slip qualities of A.W. ALGRIP—the world's only abrasive rolled steel floor plate.

ALAN WOOD STEEL COMPANY • CONSHOHOCKEN, PA.

Other Products: A.W. ALGRIP Abrasive Rolled Steel Floor Plate—Plates—Hot and Cold Rolled Sheet and Strip—(Alloy and Special Grades)

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CONSTRUCTION BRIEFS —a review of fundamentals for the plant engineer

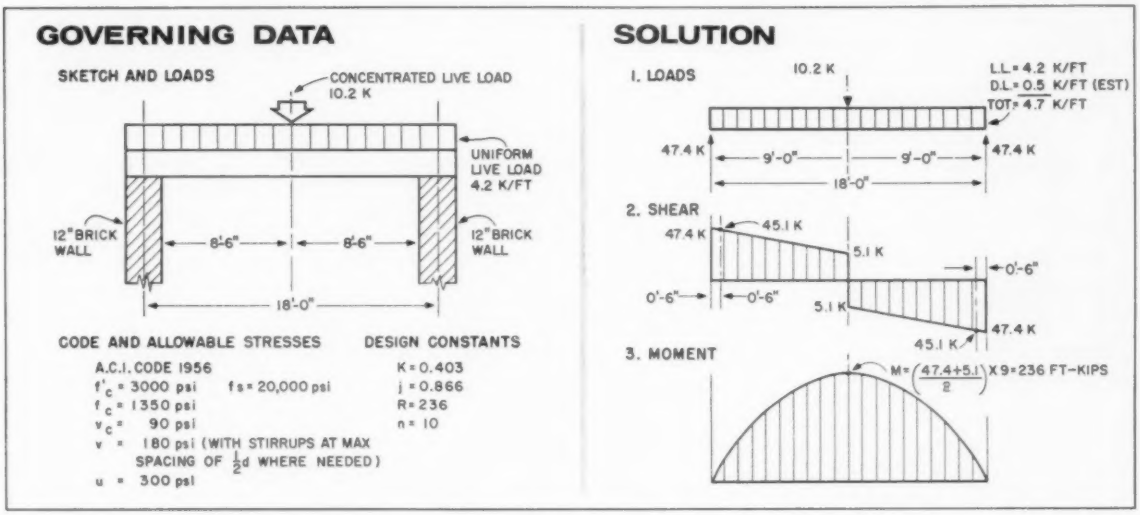
Prepared by B. A. Wasil, Structural Engineer

DESIGNING IN REINFORCED CONCRETE PART V

THE DESIGN of a rectangular reinforced concrete beam is similar to the design of a slab; a slab can be considered a rectangular beam that is 12 in. wide. However, because of the usual lengths and intensity of loading of a slab, the shear rarely goes above that value allowed without using stirrups when the thickness is controlled by the allowable compression stress in concrete. This is not generally true for rectangular beams of usual lengths and intensity of loading. Stirrups for beams are not only usually necessary, but are practical from the construction point of view.

In the past Briefs on reinforced concrete, we have developed the design equations and have shown their application to the design of a one-way slab. In this Brief, we will show the application of the equations in the design of a rectangular beam.

We will find that there are any number of practical solutions to the problem of design of rectangular sections. In this design, we shall explore two such solutions.



Design of singly reinforced beam. Steps 1, 2 and 3 shown in diagram above, under 'solution.'

4. Design for Compression

$$bd^2 = \frac{M}{R} \text{ (Design Equation)}$$

$$bd^2 = \frac{236{,}000 \times 12}{236} = 12{,}000 \text{ cu in.}$$

Any combination of b and d such that $bd^2 \geq 12{,}000$ cu in. would suffice. It is obvious that the larger the value of d selected, the smaller the volume of concrete required and the smaller the steel reinforcement required. However, formwork plays an equal role, with volume of concrete and weight of steel, in determining the cost of the beam. The perimeter of formwork, b + 2d, increases with the larger depth. A good rule of thumb for the most economical combination of b and d is $1\frac{1}{2}b < d < 2b$.

Therefore select:

b = 16 in.

d = 27½ in. + 2½ in. cover

Total beam size = 16 in. x 30 in.

$$\text{Total weight} = \frac{16 \times 30}{144} \times 150 = 500 \text{ lb/ft}$$

This checks with the estimate.

5. Check Shear

$$v = \frac{V}{bjd} \text{ (Design Equation)}$$

$$v = \frac{45{,}000}{16 \times 0.866 \times 27.5} = 118.3 \text{ psi}$$

This value is greater than allowed, so use stirrups.

6. Design for tension

$$A_s = \frac{M}{f_s jd} \text{ (Design Equation)}$$

$$A_s = \frac{236{,}000 \times 12}{20{,}300 \times .866 \times 27.5} = 5.95 \text{ sq in.}$$

Use four No. 11 bars; $A_s = 6.25$ sq in.

7. Bond check

$$\Sigma_o = \frac{V}{ujd} \text{ (Design Equation)}$$

$$\Sigma_o = \frac{45{,}100}{300 \times .866 \times 27.5} = 6.30 \text{ in.}$$

Two No. 11 bars = 8.9 in.

Two bars are all that are necessary to be extended into the support and the other two bars may be cut off

at 12 diameters past the point that they are no longer needed for the moment. The point of cutoff will ordinarily be so close to the support that is usual practice to extend all bars into the support for a beam of this type.

8. Stirrups

Stirrups are to be provided wherever the unit shear exceeds 90 psi and for a distance equal to the depth d beyond this point. The maximum spacing where stirrups are required is ½d or approximately 13 in.

The minimum web reinforcement shall not be less than 0.15 per cent of the area (16-in. beam width times 13-in. maximum stirrup spacing.)

Thus:

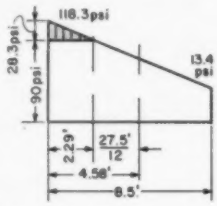
$$A_s = 0.0015 \times 16 \times 13 = 0.31 \text{ in.}^2$$

Since the area of a U stirrup is twice the area of the bar, then No. 4 stirrups, with $A_s = 0.39$ sq. in., would be required.

Initial spacing of stirrups:

$$s = \frac{A_s f_s}{v'b} \text{ (Design Equation)}$$

$$s = \frac{0.39 \times 20{,}000}{28.3 \times 16} = 17.23 \text{ in.}$$



Therefore space all stirrups 13 in. o.c. First stirrup 6½ in. from the face of the support, then sufficient stirrups at 13-in. centers to locate the last one at least 4.58 ft from the edge.

Design of doubly reinforced beam. Steps 1, 2 and 3 same as those for singly reinforced beam.

4. Design for shear

$$bd = \frac{V}{vj} \text{ (Design Equation)}$$

$$bd = \frac{45{,}100}{180 \times .866} = 289 \text{ sq in.}$$

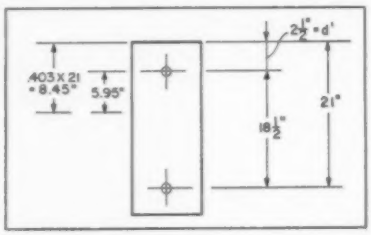
Use b = 14 in.
d = 21 in. bd = 294 sq in.

5. Check compression

$M = Rbd^2$ (Design Equation)

Moment required	236,000 ft-lb
Moment supplied	121,300 ft-lb
Moment to be supplied by compression steel	114,700 ft-lb

Due to plastic considerations it is permissible to increase compression stress in steel to twice the value expected from straight line theory of stress and strain.



$$A'_s = \frac{M'kd}{(2n-1)\, f_c\, (kd-d')\, (d-d')} \text{ (Design Equation)}$$

$$A'_s = \frac{114{,}700 \times 12 \times 8.45}{19 \times 1350 \times 5.95 \times 18.5} = 4.12 \text{ sq in.}$$

Therefore use three No. 11 bars = 4.68 sq in.

6. Tension steel

$$A_s = \frac{M}{f_s jd} \text{ (Design Equation)}$$

$$A_s = \frac{236{,}000 \times 12}{20{,}000 \times .866 \times 21} = 7.79 \text{ sq in.}$$

Therefore use five No. 11 bars = 7.81 sq in.

7. Bond check

$$\Sigma_o = \frac{V}{ujd} \text{ (Design Equation)}$$

$$\Sigma_o = \frac{45{,}100}{300 \times .866 \times 21} = 8.28 \text{ in.}$$

8. Stirrups

Maximum stirrup spacing = ½d = 10½ in. (say 10 in.).

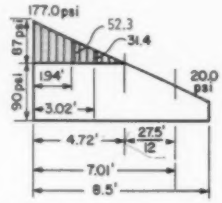
Thus $A_s = .0015 \times 14 \times 10 = .21$ sq in.

Therefore use No. 3 stirrups, with $A_s = 0.22$

Initial spacing of stirrups:

$$s = \frac{A_s f_s}{v'b} \text{ (Design Equation)}$$

$$s = \frac{.22 \times 20{,}000}{87 \times 14} = 3.61$$



Therefore space stirrups 3½ in. o.c. For spacing of additional stirrups:

When s = 6 in.: $v' = \frac{.22 \times 20{,}000}{6 \times 14} = 52.3$ psi

When s = 10 in.: $v' = \frac{.22 \times 20{,}000}{10 \times 14} = 31.4$ psi

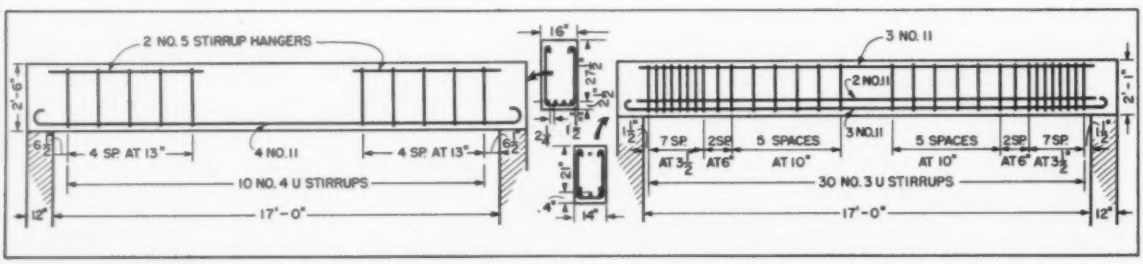
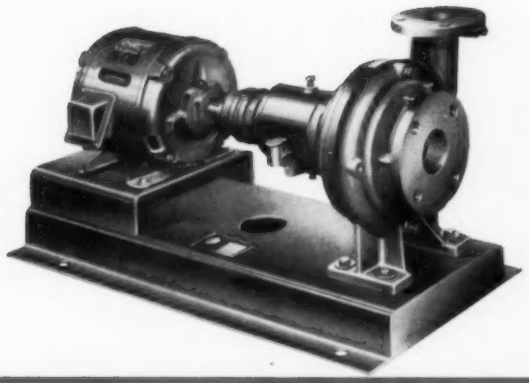
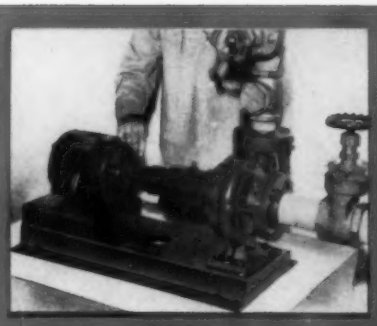


Diagram shows two solutions for same conditions. Beam at right is smaller in cross-section, but is more heavily reinforced



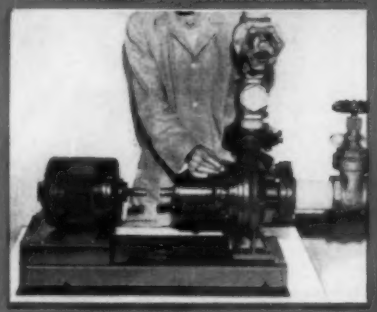
EASY TO SERVICE THIS VERTICAL SPLIT-CASE PUMP

B & G SERIES 1510-B CENTRIFUGAL PUMP

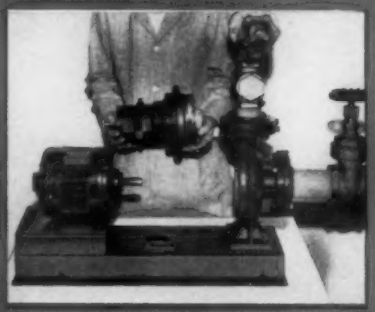


1. Loosen coupler set screw

2. Slide coupler off motor and pump shafts



3. Remove volute cover cap screws



4. Lift out complete bearing frame assembly

The photos show how easily the complete bearing frame, including seal and impeller, can be removed without disturbing piping or motor leads. The unit is replaceable and interchangeable in all pump sizes within limits of material construction.

Other features of the 1510-B include—

Mechanically balanced impeller. Balancing chamber and pressure relief holes in the impeller reduce thrust to a minimum, lengthening pump life.

Solid-type volute with support foot. Can be left in pipe line when servicing pump—rugged construction absorbs piping strains.

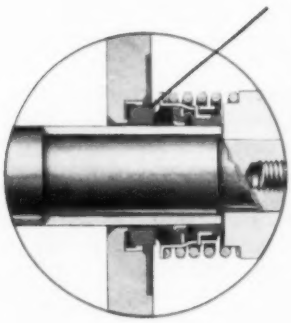
Anti-friction roller bearings. Timken bearings handle thrust and radial loads for smoother, quieter, more efficient operation.

Oil lubrication. No messy, undependable grease cups—circulating oil lubrication assures positive protection to bearings. Oil level indicator permits visual check.

Rugged steel base. Base mounted construction provides a sturdy platform for proper pump and motor alignment.

100% factory tested. Every pump hydraulically tested to meet specified conditions of head and capacity.

Capacities. To 1100 GPM, heads to 420 ft.



LEAK-PROOF "REMITE" SEAL

This exclusive feature assures long, trouble-free life—eliminates the customary leakage which occurs when a packing gland is used. A carbon seal ring faces on a "Remite" floating seat—a material developed by B&G, so hard it will scratch glass—wear-proof and corrosion-resistant.

This mechanical seal is self-lubricating. A synthetic rubber bellows seals the shaft. Metal parts are of steel, bronze or stainless steel, depending upon the type of service.

STOCK PUMPS FOR QUICK SERVICE

Selected sizes of B&G Series 1522, 1531 and 1510-B Centrifugal Pumps are stocked at the factory for immediate shipment. Capacities to 225 GPM, heads to 140 ft. Send for Price and Selection Catalog.

BELL & GOSSETT COMPANY

Dept. FJ-53, Morton Grove, Ill.

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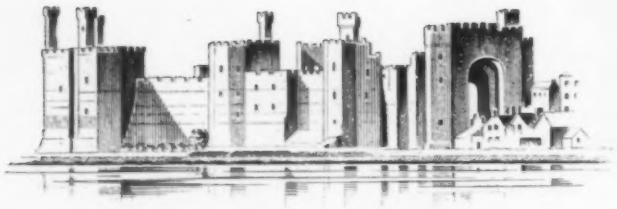

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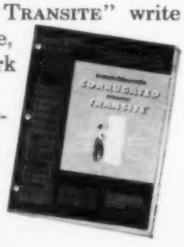

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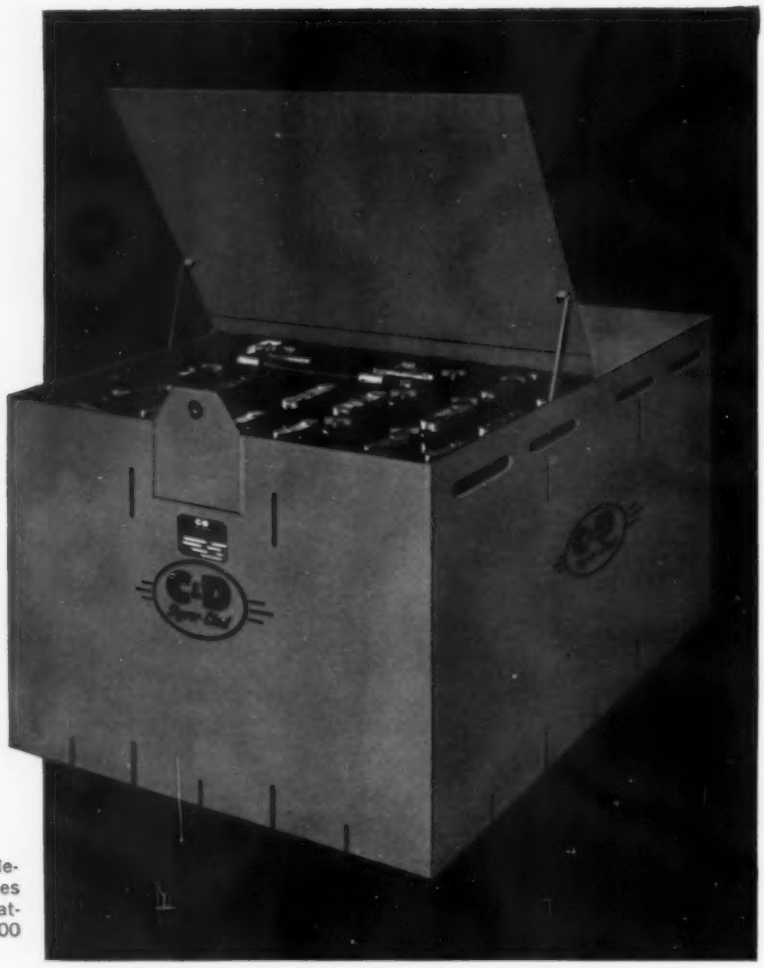

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What's Just Ahead in This Issue?

- LAYOUT copying procedure employing a mobile printer is a time-saving development of the Allentown Works of Western Electric. In this system, three-dimensional models are used to obtain a desirable arrangement. They are fastened in position and a sepia print of the layout is made. Separate copies for electrical and mechanical details are then made from the resulting master print. Information on this printer begins on the following pages.

- SCHEMATIC diagrams are the key to rapid troubleshooting on complicated electrical control circuits. Your maintenance electricians can substantially reduce downtime by learning how to understand and interpret this "electrical shorthand". Classes begin on page 89.

- PROPER selection and application of the lubricant is important in the efficient operation of lubricated plug valves. Lubricant selection should be based on several factors and have certain characteristics. To find out what these are, see the article on page 94.

- YOUR construction specifications tell the contractors what you want in any job, large or small. In addition, they can protect your company against expensive claims for liability and damage. Learn how to write a workable set of specifications by reading the article, beginning on page 96.

- PROPER preventive maintenance is a big factor in keeping air compressors on the line. Citing the case of a compressor that has logged more than 84,000 hours without breakdown, this article tells you how and when to check and inspect the compressors in your plant. To add life to your compressors, see page 100.

- ARE these statements about V-belts true or false? It is injurious to stretch V-belts. Loose belts break quicker than tight belts. The tension side of a belt should always be on top. To find the correct answers to these and other statements, turn to page 104.

- THINKING about buying a packaged steam generating unit? What are some of the items that require specification? How should they be worded? See the article beginning on page 114 on some insight on the subject of packaged steam boiler specifications.

- DON'T buy an oil seal just because it is the right size for the shaft. There are other things to consider if you want the best results; the material in the shaft, the material in the seal and the material that's being sealed all play a part. Even with the right seal, improper installation can limit its effectiveness. See page 119 for some helpful tips.

Fig. 1. In operation, printer moves over layout exposing it to intense light; the sepia print paper is bleached strongly

Scale Model Layout Copying

Printer Rides on Tracks Over Three-Dimensional Objects

By L. H. WILL, Engineer, Allentown Works, Western Electric Co.

THE EXPANSION program at the Allentown Works requires that most all manufacturing areas be relocated, expanded or have extensive rearrangements. In order to overcome the abnormally high engineering demand the Factory Planning Department developed a time saving reproduction technique whereby tracings could be developed directly from three-dimensional scale models. This would immediately reduce drafting and design effort by 20 to 30 per cent.

While the use of three-dimensional scale models of manufacturing facilities is not new, it presents a true picture of a proposed facility; visual study is improved, and vertical dimensions compared and determined to a better degree. The broad use of models at the Allentown Works, with its associated printing device, has contributed materially to resolving engineering personnel shortage and meeting the design schedule requirements.

The layout engineer divided the building into sections, using the areas between main aisles as units, and spaces between toilets, stairwells and other permanent parts in the periphery to form units in that area. All sections were of sizes that would conform dimensionally to a standard drawing sheet. These sections were numbered. Sheets of unsensitized Mylar of 0.005-in. thickness were cut to exact dimension of these sections. Each of these sheets was given the same number.

Layout Boards

In order to be able to assemble, in one continuous building group, all of these panels or sections, the Mylar sections were duplicated in size by ¾-in. Lebanex plywood. These plywood building panels are our so called layout boards. Each of these layout boards had the comparable section or panel of the Mylar placed upon it.

After all of the sections or panels were constructed they were assembled in order on a table, the scaled area being representative of a floor of the building. We used $\frac{1}{32}$-in. wide black Scotch tape to indicate column line centers and $\frac{1}{16}$-in. wide black Scotch tape to indicate aisle lines. All walls and partitions were shown with special cross-hatched tape. Other permanent items such as drinking fountains, time clock stands, columns, etc., were indicated with tapes cut to accurate scale. The entire assembly was made to ¼ in.-1 ft scale.

Three-dimensional scale models were made of all facilities. The models were constructed of wood with the base the exact shape of the machine base with all projections, etc. The upper portion of the model duplicated the machine to accurate proportions. The models were clearly marked with small pieces of tape which had the machine number and class typed on it. Models were then filed by number in a compartmentalized drawer file cabinet.

This preparatory work, once finished, required no further effort other than to indicate permanent building structure changes or changes and additions to machinery.

At this point, the functional product engineer is contacted so that he could select his models from the model file and proceed with the layout. The product engineer predetermines, in rough draft, the flow of work requirements. With this rough draft he then proceeds to place his models on the Mylar panel in approximate positions. Once he is satisfied with the layout he must reposition the models in exact location to permit dimensioning for good layout.

In order to assist the product engineer in his layouts of the various areas the layout engineer designed and prepared small devices of clear plastic for precise dimensions. These tools enable the product engineer to conform to plant standards related to aisle space and proximity of machines to each other.

The next step is for the product engineer to permanently affix the models to the sheet of Mylar; this he does with the use of double adhesive dots. The models are held substantially but not to the point where they cannot be moved or relocated easily when required.

When the layout engineer and the product engineer are satisfied that they have achieved a layout consistent with Western Electric requirements and practices, a thin piece of clear Scotch mending tape is placed in a blank portion of the Mylar panel. The initials of the functional management personnel responsible for approvals are obtained on this small strip.

Up to this point there is probably no variation of the technique in the use of the three-dimensional models by the Allentown Works compared with any other Western Electric location or other manufacturing company, nor is the effort expended any greater than if templates were used.

From here on out the heart of our newly devised reproduction system, or, so called model printer, is put to work to save design effort. The model printer includes a long table with two tracks upon which runs the printing device. See Fig. 1. The table is 12 ft long by 4 ft, 2 in. wide. The table top is recessed at one end to be able to receive the

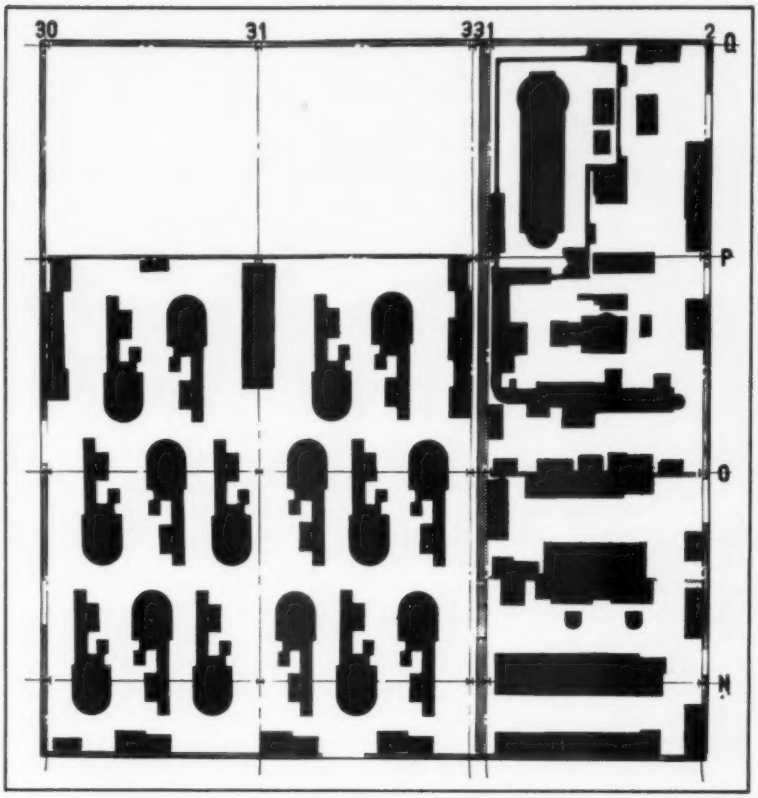


Fig. 2. Areas covered by models are brought out on the developed sepia print

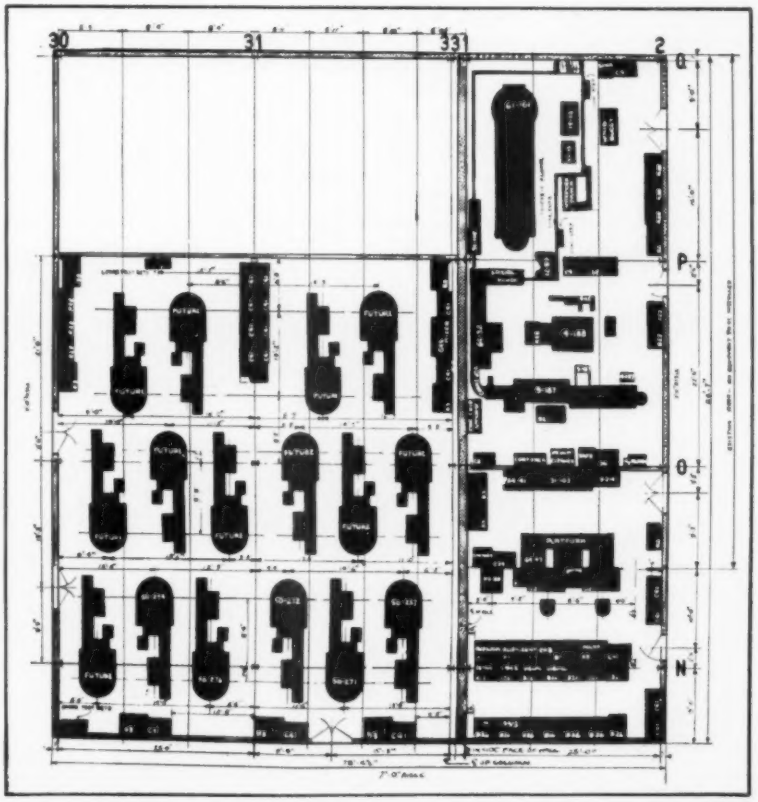


Fig. 3. Master sepia has dimensions, equipment numbers, identity (not shown)

"largest" plywood building panel so that the upper space of this plywood panel is flush with the top of the printing surface of the table. After the building panel with the scale models on the Mylar is inserted in this recess, the Mylar sheet with the scale models affixed can easily be slid onto the printing surface of the table.

The printing device is approximately 5 ft long and 1 ft wide. It is semi-automatic and rides along the tracks above the table and over the model layout. Light is supplied by 10 sun lamps of 275 watts each. The speed is controlled to produce various printing intensities.

Entire mechanism is cooled by two fans built into the unit. In order to further reduce the heat transmitted from the lamps to the Mylar and the models a large piece of ¼-in. plate glass running the full length of the printing surface lies below the printer and about 4 in. above the printing surface. The glass slides on nylon rollers so it can be positioned for printing and placing the papers used for printing in the desired position.

Producing a print is simple; the layout board, with Mylar panel and completed layout, is placed in the recessed area of the printing table. The glass section is slid out of the way, and a piece of sepia paper of proper size is placed on the printing surface of the table. The Mylar panel is then slid from the layout board onto the sepia paper. Small pieces of ¼-in. Plexiglas are placed over the layout between the models. This holds the layout firmly on the sepia paper.

The printing glass is then positioned over the layout and all is in readiness for printing. The printer is turned on; speed set and the push button controlled printer moves over the layout. The printing cycle complete, the glass is again slid out of the way and the Mylar panel is pushed back onto the layout board. The sepia paper is removed and is run through the developing section of an Ozalid Printer. This complete, we have a model layout reproduced on sepia paper.

Copies of Layout

After this phase of the reproduction system is complete, the next step is to provide the draftsmen with "tracings" for the various mechanical and electrical services. The tracings should be complete with dimensions, locating equipment and permanent building facilities.

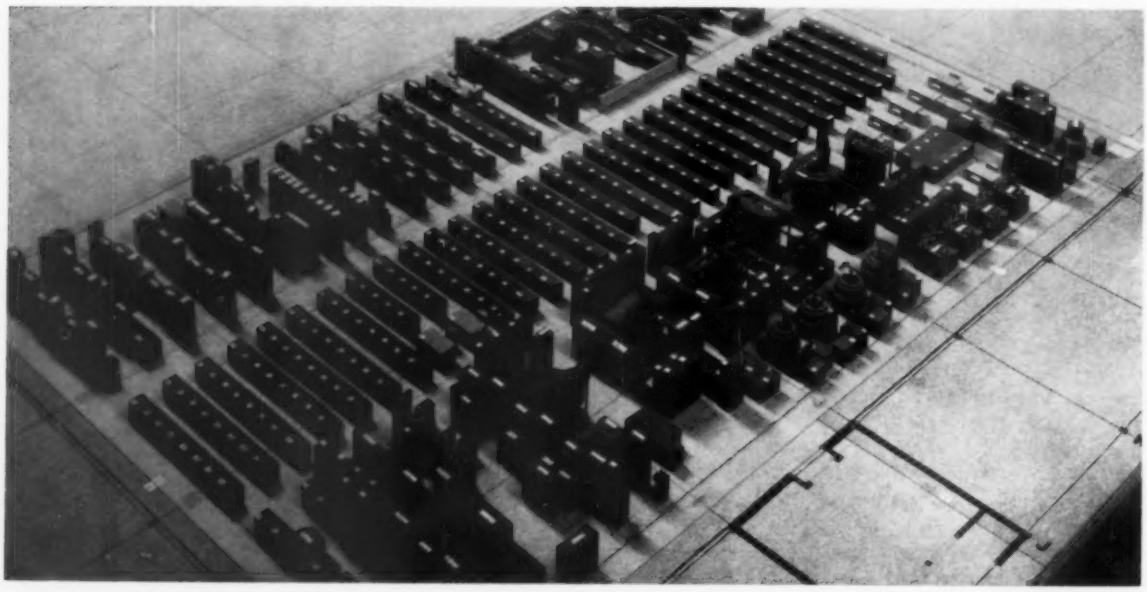
We selected two standard drawing size printed sheets of tracing cloth complete with border lines, title box, etc. We ran one of these sheets with the one we just made of the model layout through the Ozalid Printer on a sheet of sepia paper. The density of the imprint on this sepia is deliberately made an opaque chocolate brown with clear, sharp cut edges. On the sepia print we indicated area dimensions related to permanent building structures. We then have a master drawing.

From this master we made three more sepias. These sepias were made light enough so that lettering or dimensions would clearly show on the finished prints. One of the sepias was used for the finished layout drawing, one for the mechanical, and one for electrical drawings. Figure 4 shows a model layout of a manufacturing area at the Allentown Works.

In summary, we have taken three new steps after the model layout, producing a sepia, a master, and then three sepias, to complete the entire cycle. The total time required has varied from three hours to six hours dependent on the size and extent of the layout. To accomplish the same results by manually drawing the layout from templates or models would take from one to three days.

The reduced employee force required to handle layout work is the big factor to be considered in a competitive market for engineers, designers and draftsmen. We believe that this printing device will eventually change the pattern inherent in plant layout procedure. **End**

Fig. 4. In typical printing procedure wooden models are moved over sepia paper on the transparent Mylar sheet

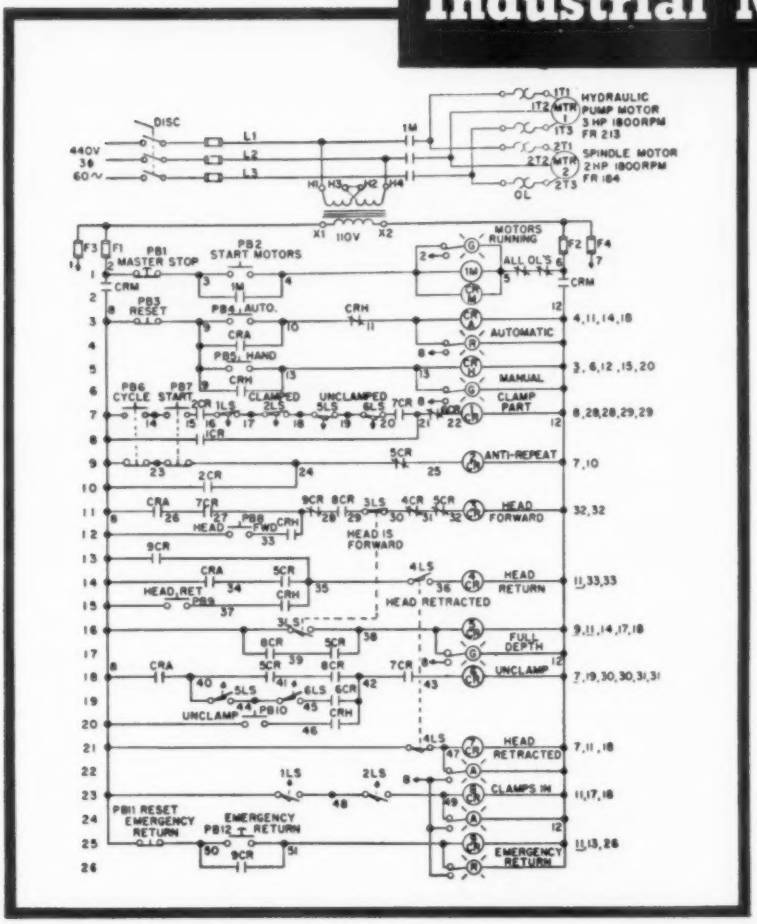


Troubleshooting Industrial Motor Control

Can Your Electricians Read This Schematic Diagram?

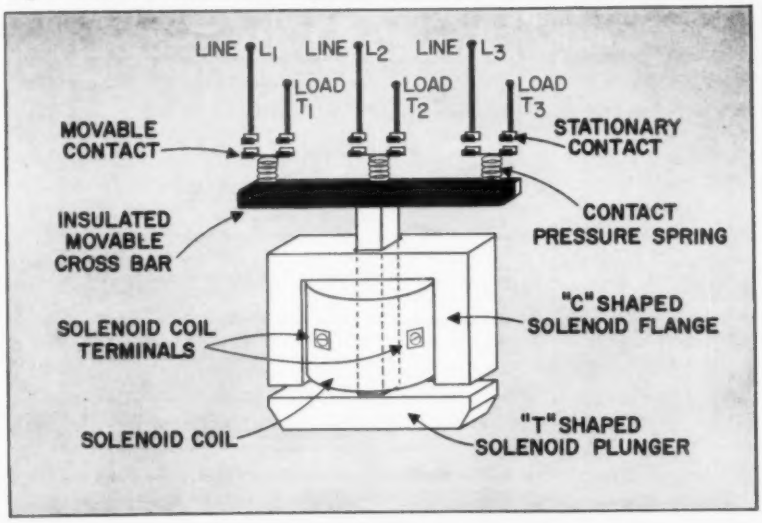
Long downtime periods on modern equipment is partly due to the more complicated wiring circuits necessary to obtain automatic operation . . . Understanding schematic drawings of magnetic motor starters and their associated control circuits will help your maintenance electricians rapidly pinpoint and correct possible faults

By VERN KEMPF
Electrical Editor,
Plant Engineering



Typical schematic diagram of control circuits on a relatively simple machine tool

Fig. 1. How a solenoid is used to provide operating force for a magnetic contactor



MAGNETIC motor starters, contactors and relays all make use of the solenoid* to provide the force necessary for their operation. Figure 1 shows the most common method of harnessing the power of the solenoid to close electrical contacts. The solenoid plunger has been extended through the top of the solenoid frame and carries a crossbar made of an insulating material.

Spring-loaded contacts are attached to the crossbar and are called the movable contacts. These contacts have two buttons that are arranged to bridge between two stationary contacts when the crossbar moves upward under the influence of the energized solenoid.

Above the movable contacts are the stationary contact tips. There are two for each pole of the contactor and they are fastened into an insulating material that serves to support them and insulate them from each other.

The left hand contact of each pole

*Basic theory and operation of the solenoid was described in the article "Servicing the Solenoid" that appeared in the May, 1958 issue, page 122

is identified as L1, L2, and L3. These are the line connections and connect to the voltage source. The right hand contacts of each pole are identified as T1, T2, and T3. These are the load connections and the device to be controlled is connected to these terminals.

We can wire a simple pushbutton into a circuit controlling the contactor and see how it works. Figure 2 shows a connection taken from L1 to the pushbutton, through the pushbutton to one side of the solenoid coil, through the coil and then to L3. In this example, we are impressing full line voltage across the solenoid coil and the rating of the coil must be the same as the line voltage.

The solid lines indicate that we have voltage on one side of the pushbutton and also on one side of the solenoid coil. If we press the button, Fig. 3, we have completed the circuit to the solenoid and the solenoid plunger closes tight against the frame. This also lifts the crossbar carrying the contacts and brings the contacts together. The solenoid is now "closed" and if we had a load connected to T1, T2, and T3, the load would be energized.

The contactor will remain closed as long as we have voltage present in the line and as long as the pushbutton is held closed. As soon as the pushbutton is released the circuit is broken and the solenoid becomes de-energized. The plunger, contact bar, and movable contacts drop down, due to the pull of gravity. This action is assisted by the compressed contact springs. This breaks the circuit to the load on connections T1, T2, and T3.

The contactor opens and closes very fast and some applications require operating rates of many times a minute. High-speed operation shortens the mechanical life of the contactor as they literally pound themselves to pieces. This is particularly true of the larger sizes as the moving mass of the plunger is larger and impact forces are higher. When you have an application calling for operation several times a minute, check with the manufacturer for his recommendations.

If we connect a float switch in the control circuit, Fig. 4, and a pump in the load circuit, we have a complete motor control system. In a sump pump application, the float switch closes, as the water rises, energizing the circuit to pump the water out. When most of the water has been pumped out, the float switch opens, stopping the pump. This is a very common circuit and is frequently called an "On—Off" control system.

To save drafting time, the contactor is generally drawn as shown in the physical diagram Fig. 4. This shows a circle for the solenoid coil and dashed lines connecting the movable contacts. A careful examination

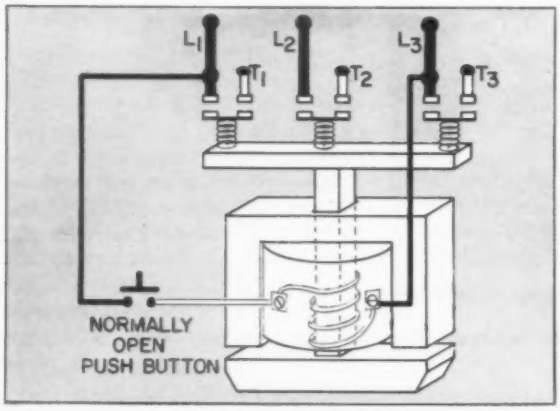
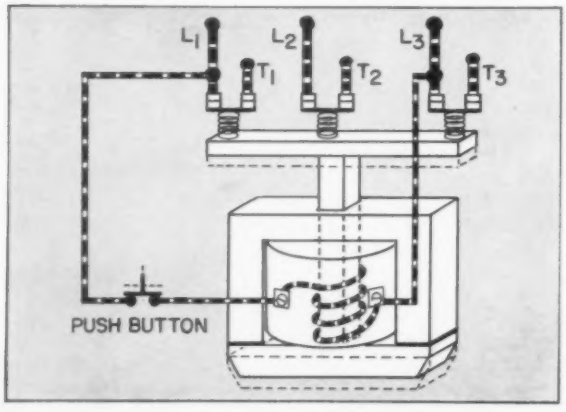


Fig. 2. Circuit arranged to energize solenoid coil when push button is depressed. Solid lines show presence of voltage

Fig. 3. When circuit is completed, solenoid plunger carries cross bar up, closing contacts. Dashed lines show current flow



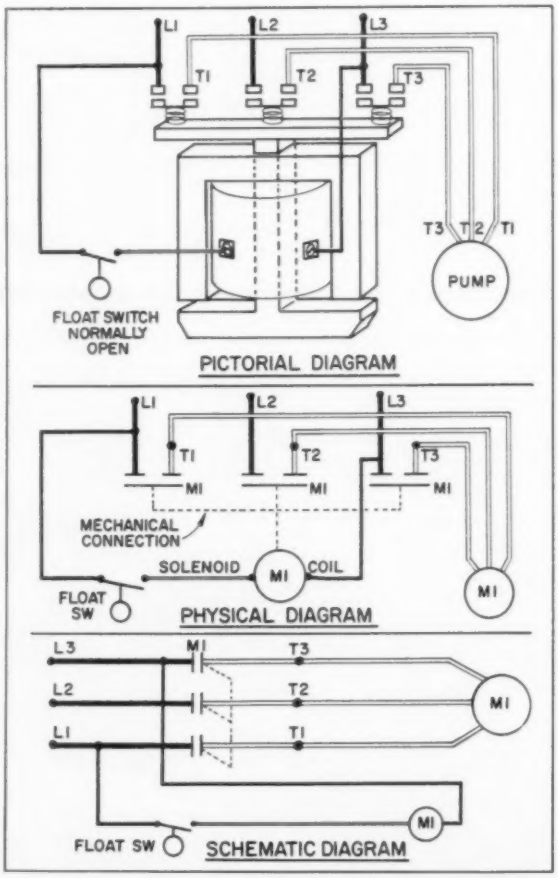


Fig. 4. These three diagrams show exactly the same electrical connections. Note simplicity of the schematic presentation

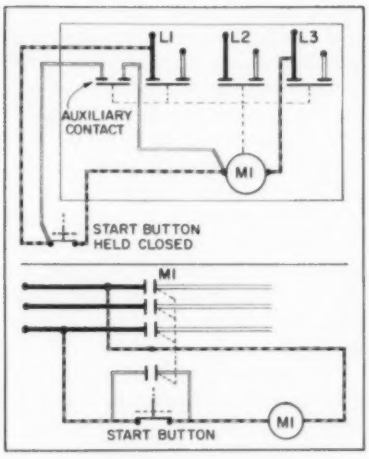


Fig. 5. Dashed lines show the flow of current through solenoid coil when the pushbutton completes the control circuit

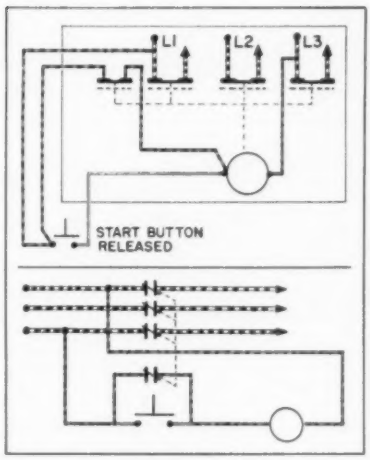


Fig. 6. Current flows through auxiliary contact mounted on cross bar, maintaining the contactor in closed position

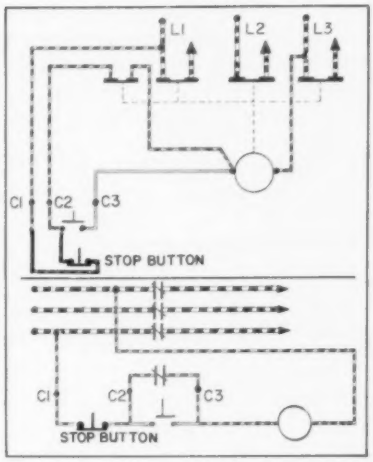


Fig. 7. Normally closed stop button provides a method of breaking circuit held closed by auxiliary contacts

of the pictorial and physical diagrams will show that they have the same electrical connections. This is a symbolic drawing of the magnetic contactor with the parts arranged in their natural position. This is also called a physical wiring diagram because the parts are physically arranged as you would see them in the actual circuit.

Schematic Diagrams

Figure 4 also shows this same circuit arranged in schematic form. The schematic diagram is very useful in industry and is the basic drawing used for developing complicated control circuits. It is also indispensible for gaining a quick understanding of how a circuit operates and for troubleshooting. In the schematic drawing, all components common to a particular circuit are arranged in a horizontal line across the drawing. In Fig. 4, it is obvious that the float switch and the solenoid coil are in series with each other. When the float switch closes, the circuit will be complete to the solenoid.

This may seem to be an oversimplification but when a circuit contains five or six relay contacts from various relays in a control panel, it is very difficult to visualize which contacts must be opened or closed to operate a given control relay. The schematic drawing shows these relationships at a glance.

Your men will never be really good at troubleshooting machine control circuits until they can study a schematic drawing and see the relationship between various contacts and solenoid coils and then find these components rapidly in the control panel. In this way, looking at the schematic drawing, they decide what could be wrong and how to test the circuit and then put the tester on the same wire in the control panel.

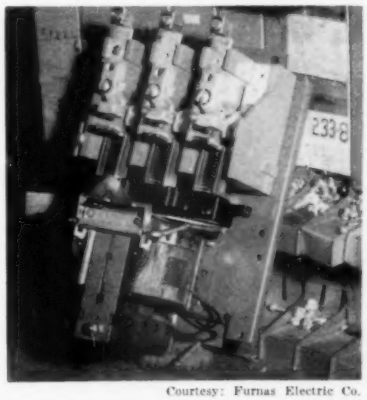
All the illustrations in this series will be shown both in physical and schematic form. Have your men study both of them to gain an understanding of how they work. Put a pencil on a contact or wire in the schematic drawing and then have them find that same contact or wire in the wiring diagram. Do this repeatedly until they can move back and forth between the drawings rapidly and with complete confidence.

We are now ready to talk about the conventional start-stop circuit used to start and stop a motor on command of the operator. In the previous circuits, the float switch was held closed by the water in the sump pit to keep the motor running. Obviously, it is impractical for the operator to hold the start pushbutton closed, during the time he wants the motor to run, so some means must be provided to hold the circuit closed when he releases the start button.

This is accomplished by adding another contact on the crossbar of the starter. Called an auxiliary contact, it closes when the main contacts close. Figure 5 shows a typical circuit with a start button replacing the float switch and with wires connecting the auxiliary contact to the start button.

Note that the auxiliary contact is connected in parallel with the start button. This is readily observed on the schematic diagram. When the start button is depressed, a circuit is completed to the solenoid coil "M1" and the contactor closes as shown in Fig. 6. This also closes the auxiliary contact and provides a second path for the voltage to the coil. We can now release the push button and the contactor will remain closed.

If the contactor will not remain closed when the start button is released, it indicates that there is trouble in the auxiliary circuit. A broken wire, poor contact or dirty



Courtesy: Furnas Electric Co.

Partially assembled contactor showing cross bar, contacts, solenoid and frame

connection could be the cause. Whenever a starter will not stay closed, carefully check the auxiliary contact circuit.

With this arrangement, the main contacts are closed and cannot be opened unless we momentarily interrupt the voltage to the solenoid coil. This is accomplished with a stop button. The stop button is a normally closed pushbutton that opens the circuit when it is operated. It is wired in series with the auxiliary contact as shown in Fig. 7.

When the stop button is operated, it breaks the circuit to the solenoid coil and the contactor opens. When the contactor opens, the auxiliary contact also opens and the stop button can now be released without danger of the contactor closing again until the start button is operated.

Some control installations require an additional emergency stop button located some distance from the regular stop button. This can be readily accomplished by wiring the additional stop button in series with the regular stop button, Fig. 8. As the two stop buttons are wired in series, either one can break the circuit and open the contactor.

Long conveyor lines and other applications frequently require two, three or more start-stop control stations located along the length of the equipment. These are wired into the circuit as shown in Fig. 9. Remember that stop buttons must be in series with each other and start buttons in parallel with other start buttons.

If the sump pump in Fig. 4, should become clogged or overloaded, it will draw more and more current until it burns out. We can prevent this by using thermal overload devices. Addition of the thermal overload changes the magnetic contactor to a magnetic motor starter.

Thermal Protection

The thermal overload is placed in two or three of the motor leads and constantly monitors the current going to the motor. This current is converted into heat and when a predetermined amount of heat is produced, opens a normally closed contact, wired in series with the solenoid coil. The motor starter drops out and the motor stops. Overload devices can generally be reset after cooling for about one minute and the motor can be started again. If the overload persists, it will trip out again. This is your cue to find out why the motor is drawing excessive current.

These devices will not protect the motor unless they are the right size. Be sure to check the manufacturers recommendations when installing an overload element. If it is too small, the motor will trip out frequently and if it is too large, the motor will not have the proper protection and may burn out.

Figure 10 shows how these thermal overload elements are placed in series with the wires leading to the motor. In this position, all the current passing through to the motor must pass through the overload. Also shown is the normally closed contact in each overload device. This is wired in series with the solenoid coil to de-energize the starter in the event of an overload. Study both the physical and schematic drawings to see how these overload elements operate.

Thermal overload devices are relatively slow in operation and provide no protection when a short-circuit occurs. A fused safety switch can be placed in the line ahead of the starter or can be built right into the same enclosure. Figure 11 shows a magnetic motor starter equipped with a circuit breaker to provide short circuit protection. This is known as a combination motor starter. It combines the functions of motor protection and short-circuit protection in one unit.

Combination motor starters may also be equipped with a control circuit transformer to reduce the voltage of the control circuit to a lower value. These are widely used on 440-v circuits and generally limit the voltage on the control circuits to 110 volts. Study both drawings and see how these new components have been added into the circuit.

When a motor stops for no apparent reason, an electrician is generally

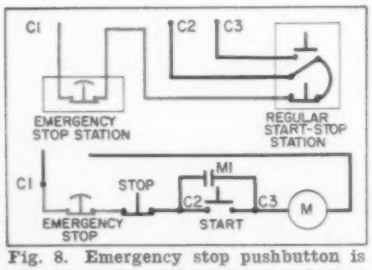


Fig. 8. Emergency stop pushbutton is wired in series with regular stop button

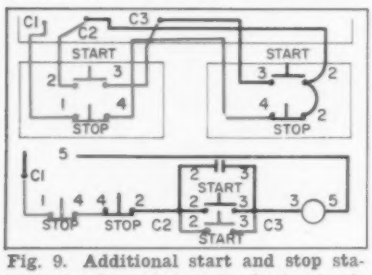


Fig. 9. Additional start and stop stations can be added to the basic circuit

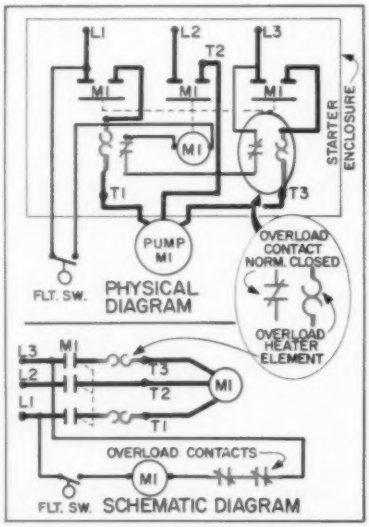


Fig. 10. Adding overload elements converts contactor to motor starter

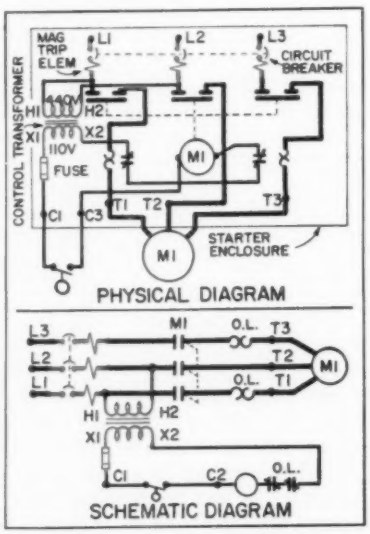


Fig. 11. Combination starter also has circuit breaker and control transformer

called to determine the trouble. The fault can be quickly located and corrected if a step-by-step method of checking the motor starter is used.

The first item to check is the thermal overload relays. The operator may not have allowed enough time for them to cool or failed to press the reset button hard enough. Open the door of the starter enclosure and examine the trip lever on the thermal overload. Generally you can see if this lever is tripped. If the overloads seems to be in proper position then a more thorough check with your voltage tester is necessary.

Trouble-shooting

Check the incoming line voltage to make sure that trouble further back in the distribution system is not at fault. Check from L1 to L2, L2 to L3 and L1 to L3, as indicated in Fig. 12. All these readings should be equal and indicate the line voltage. If the incoming line is satisfactory, move your tester down to the points A, B, and C in Fig. 12, and check the operation of the fuses or circuit breaker. Voltage should be read from A to B, B to C, and A to C. Three readings equal to line voltage will indicate correct operation to this point.

If you cannot obtain a reading from A to B and from B to C, it would indicate that B phase is in trouble. Trouble with individual phases are seldom encountered with circuit breakers but these tests are necessary with fused switches to determine which fuse has blown.

If you cannot obtain any reading on the load side of the fuses it means that two fuses are blown. This can be checked by putting one lead of your tester on L1 and then touch B and C. If you read voltage when it touches B, then B phase fuse is in good condition. If you do not obtain a voltage reading from L1 to C, it indicates that the C phase fuse is blown. To check the A phase fuse, put one lead of the tester on L3 and the other lead on A. No reading at this point indicates the A phase fuse is also blown.

If satisfactory readings have been obtained up to this point we can begin to check the control circuit. Place one lead of the tester at point D, below the control fuse, and the other lead at point E, on the solenoid.

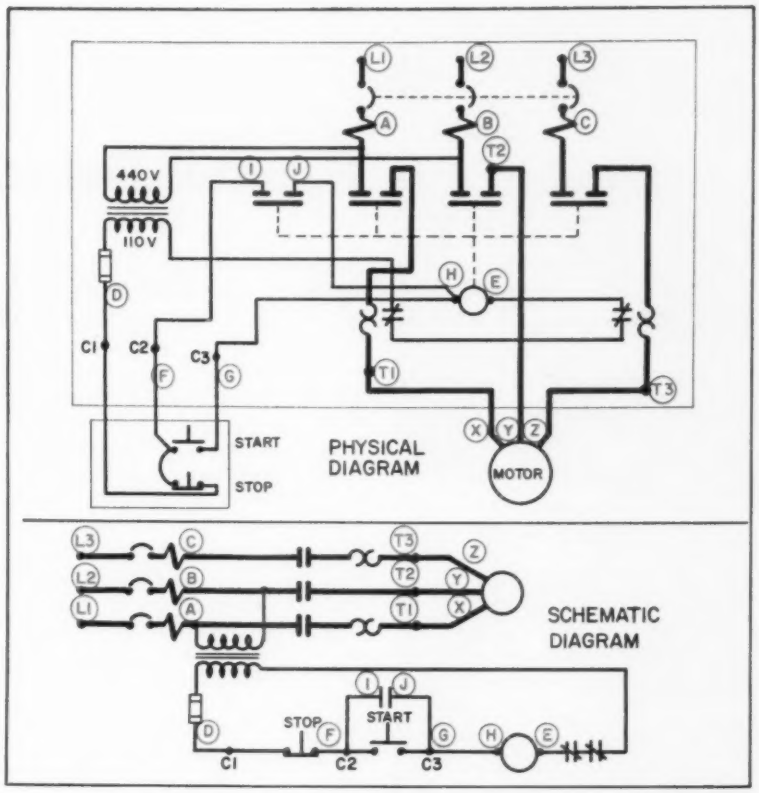


Fig. 12. Rapid troubleshooting of motor starters consists of logically testing and eliminating potential faults. Step-by-step method saves valuable time and effort

This test checks the control fuse and the overload relay contacts. If the control fuse is good and the overload relay contacts are closed, you should read the control voltage. If you do not obtain a reading, check above the fuse to determine if the fuse is blown and also directly across the control transformer to make sure control voltage is available.

With one lead of the tester on point E, we can progressively move the other point along the control circuit to points F, G, and H to rapidly check the rest of the circuit. No voltage at point F indicates the stop button is open. A broken wire or poor contact in the stop button may be at fault.

With the tester at point G, hold the start button down. This should indicate voltage when you press the button and the voltage should disappear when you release the start button. Move the test prod to point H, directly on the solenoid coil. You are now testing directly across the solenoid and if you have full voltage available and the solenoid still does not operate, it is defective and requires replacement.

If the contactor closes when the start button is depressed, but drops out again as soon as it is released, check to see why the auxiliary circuit, points I and J, are not holding the circuit closed.

If the starter opens and closes correctly when the push buttons are operated but the motor does not seem to operate as it should, additional tests are needed. With the contactor closed, check the voltage from T1 to T2, T2 to T3, and T1 to T3. These voltages should all be equal and read line voltage. If these readings appear satisfactory, open the motor lead box on the motor and check for voltage directly at the motor leads. A broken wire anywhere in the conduit system or in a motor lead can result in single phase operation. This will show up as a sluggish hot running motor. Occasionally, the motor will not start at all but will produce a loud magnetic hum when it is energized. This is also a sign of a single phase condition in the motor. **End**

Lubrication steps for lubricant screw method. First remove lubricant screw

The proper size stick of the selected lubricant is then inserted in the opening

The lubricant stick should then be forced into valve by turning screw

Proper Selection and Use of

By R. FRED KLEIN, Lubricated Plug Valve Div., Walworth Co.

BEST PERFORMANCE of lubricated plug valves depends largely on proper selection and insertion of lubricants for the particular service. You can choose from a variety of lubricants which are designed to operate in temperatures ranging from —80 F to 600 F and on service extending all the way from absorption oil and barium chloride to xylene and zerconium tetrachloride.

A lubricant is used in a plug valve to minimize friction, prevent the plug from sticking, combat corrosion by coating the seating surfaces and to seal the valve against leakage in the closed position. It also facilitates valve operation by freeing the plug from its seat through hydraulic pressure in the entire lubricating system. While some luburicants fill one or more of these functions satisfactorily, the right lubricant performs all of them well.

Because of the variety of lubricants available, choice of lubricants should be made in consultation with a lubricated plug valve manufacturer or his representative. The basic factor in the selection is line content. Consideration of this factor reduces the number of available lubricants to a few that are serviceable for the particular condition. Other elements to be considered are color of the lubricant, contamination, temperature, mixed service condition and the presence of nitrating acids.

The color of the lubricant—light brown, brown, white, gray white, black, etc.—is a factor for selection only when it is necessary to protect the line contents against discoloration. A white lubricant is then the choice.

Where the line content is foodstuffs or pharmaceuticals, the lubricant to be used should be chemically sterile and neutral to avoid contamination.

Each lubricant is designed to serve within a certain temperature range. When two or more lubricants are recommended for the same service conditions, the one with the lower maximum temperature rating should be selected where possible, because the lower the maximum temperature rating, the softer the lubricant will be at normal temperature, and therefore, the easier it will be to operate the valves. At elevated temperatures, the stiffer lubricants become softer, and are as efficient a sealing and lubricating medium as those having lower temperature ratings.

A compromise between lubricants is necessary where the pipeline contents are mixed and have more than one characteristic. It is a good general rule to select the lubricant recommended for the predominant part of the pipeline contents.

If nitrating acids are being handled in the line, it is important that the correct lubricant recommended by the valve manufacturer be used.

Lube Characteristics

While lubricants may differ from one another in the type service for which they are designed, they should have certain properties in common. Before any choice is made, no matter what the lubricant, it should be checked for the following characteristics:

1. Lubrication. First of all the lubricant must do what its name implies—lubricate. It must be "greasy" and have a definite lubricating value, so the plug can be easily rotated.

2. Insolubility. A lubricant must retain its consistency and resist any

Lubricants for Lubricated Plug Valves

Choice of lubricant should be based on several factors: Line content, color of lubricant, contamination, etc. . . . Here are some suggestions to help you select the proper lubricant for your particular conditions

erosive action of the line contents.

3. Wetting Effect. A lubricant to be effective must adhere to the metal seating sufaces of the lubricated plug valve.

4. Body. A lubricant must have sufficient consistency to seal the valve against leakage. However, it must not harden and block the lubricant groove system, nor must it solidify in the reservoir under the plug. This characteristic is essential in order that new lubricant can be inserted as needed.

5. Corrosion Protection. The lubricant must protect seating surfaces against corrosion. Corroded plug and body surfaces can cause excessive operating torque.

Stick Lubrication

Some lubricants are carried in bulk only, and others in sticks only. But most lubricants can be obtained in either form. The most satisfactory method of lubricating plug valves is the forcing of stick lubricants into the valves with a lubricant screw or by a high pressure lubricant gun.

First step in lubricating by the lubricant screw method is to remove the screw at the topmost part of the valve. The proper size stick of the selected lubricant is then inserted. Replacing the screw and turning it down forces the lubricant into the valve. Additional sticks are inserted and forced down until back-pressure is felt on the screw, indicating that the lubricant system is full and under pressure.

A high pressure lubricant gun facilitates servicing valves, and is particularly valuable on a large number of valves which are installed in proximity. If the services are such as to require more than one lubricant, a color code may be adopted. By painting, with matching colors, the valve tops and the guns loaded with appropriate lubricants, proper valve servicing may be obtained, even when done by inexperienced personnel.

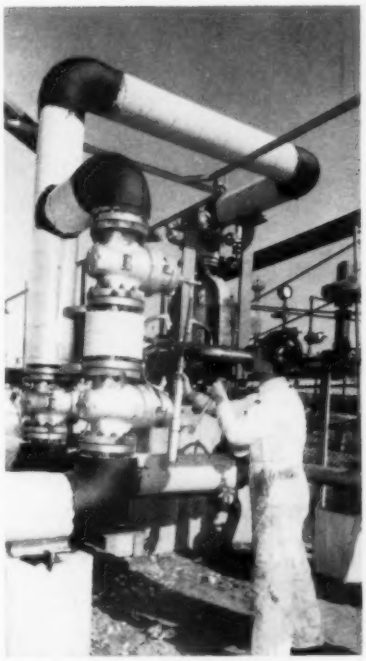
The lubricant guns available vary in design, and the manufacturers' directions for charging the guns should be followed. The different models also vary in pressure. It is therefore important to have a gun with adequate pressure to force full-bodied lubricants as well as the softer grades of lubricants into the valves.

An important rule in adding lubricant to lubricated plug valves is to make certain that no solid material is permitted to enter the lubricant space of the valve.

Operation of the valve while forcing in the last stick of lubricant will facilitate the uniform spreading of lubricant over the finished surfaces. of the plug valve.

Unless otherwise ordered, lubricated plug valves, when received from a manufacturer, contain only a light assembly lubricant for protection of the finished surfaces. This lubricant, depending on the type used by the manufacturer, is resistant to certain kinds of service. For these services it is not necessary to clear the lubricant from the valve before the valve is put into operation. It is only necessary to add the correct lubricant. However, for other services, the new valves, must be purged of the assembly lubricant and completely filled with the proper service lubricant required for the operation.

A valve that is infrequently operated and which usually stands in the open position offers little chance for its lubricant to be washed away. Such valves should be operated and lubricated about every six months. On the other hand, a valve which is opened and closed several times daily may require more frequent lubrication. If the lubricant fitting turns easily it is an indication that lubricant is needed. Once the valve is fully lubricated, it is a good practice to keep the lubricant fitting turned down, thus maintaining constant pressure on the lubricant system.



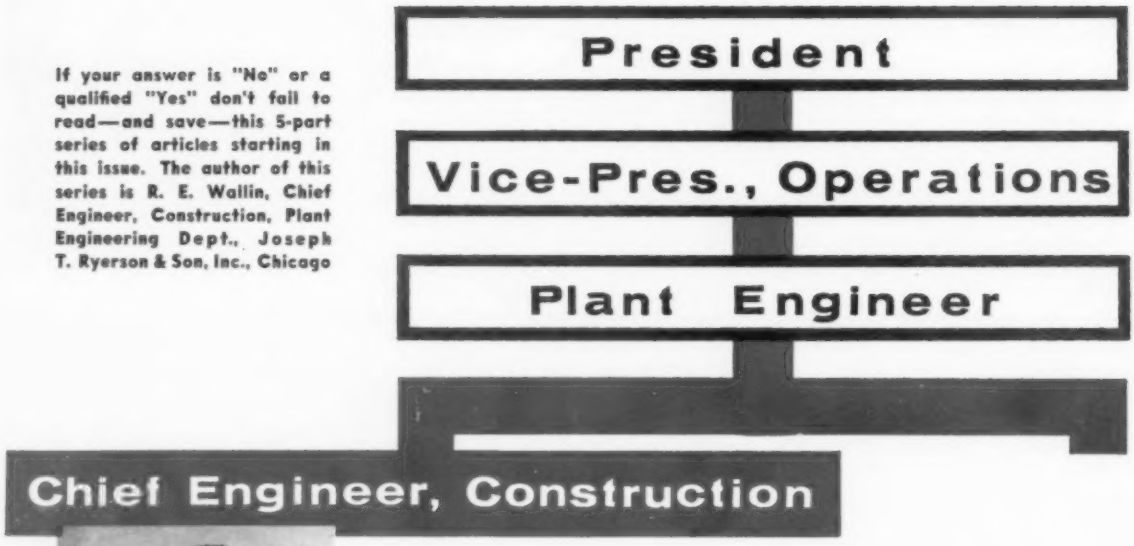
High pressure lubricant guns are used when servicing the large-sized valves

When it is necessary to remove lubricant from a valve in order to relubricate for other service conditions, the old lubricant should be cleaned out with a solvent. It is especially important to clean out all the old lubricant from the valve if the new lubricant is a softer type than that previously used. **End**

. . . IF FACED WITH A MAJOR CONSTRUCTION PROJECT, COULD YOU:

1. WRITE A WORKABLE SET OF SPECIFICATIONS?
2. ENTER INITIAL NEGOTIATIONS WITH CONTRACTORS FOR BIDS?
3. ANALYZE THE BIDS AND CARRY THE NEGOTIATIONS THROUGH TO THE SIGNING OF THE CONTRACT?
4. FOLLOW UP ON ALL TASKS NECESSARY AFTER THE CONTRACTOR HAS STARTED WORK, TO FINAL INSPECTION AND ACCEPTANCE?

If your answer is "No" or a qualified "Yes" don't fail to read—and save—this 5-part series of articles starting in this issue. The author of this series is R. E. Wallin, Chief Engineer, Construction, Plant Engineering Dept., Joseph T. Ryerson & Son, Inc., Chicago



R. E. Wallin, the author, during his forty years of employment with the 115-year-old firm of Joseph T. Ryerson & Son, Inc., has seen the company grow from four plants to its present 18-plant organization. He has been responsible for the acquisition of plants, expansion-construction at existing plants, and the building of new plants.

These activities have spread from determining what will be done and the preparation of appropriation requests to making final inspections and purchasing the plant equipment.

Why Specifications Are Important

PLANT CONSTRUCTION must have a firm foundation on which to build. Figuratively, the true foundations underlying the physical construction are the plans and specifications which cover the particular project. Major equipment items and other projects should also be covered by plans and specifications to assure bids on a competitive basis.

Plans are lines and dimensions with sufficient notes to convey to the craftsman a picture of the finished product, the size of the component parts, and briefly the materials which are to be used in the job. However, the plans do not give the complete picture. If they were so drawn, one could not clearly read the plans for all the notes and references which would clutter them. Therefore, the plans are supplemented by specifications, or "specs," as most construction people call them.

You, a plant engineer, responsible for the completion of a construction project and the providing of equipment, should be fully conversant with plans and specs. You do not have to know how to draw plans or write specifications as this is the responsibility of architects and engineers whose services you retain, and who are experts in this activity.

You should, however, know what constitutes a good set of plans and a good set of specs, so that you can intelligently outline what result is desired in your conferences with the owner, architects, engineers, and any others who may be concerned. Also, such knowledge is necessary so that you can check the finished plans and specs to make sure that they properly cover the job, that everything which is not on the plans is in the specs, and that the specs include the information and characteristics you require to achieve a completed job without costly extras, revisions, and disputes.

Specifications should specify in detail exactly the desired results. They should cover all things which are not shown on the plans and should be clear and complete, but also brief and to the point. When questions arise between you or your engineering consultants and the contractors doing the work, they should provide the answer to settle the matter.

Every good set of specifications contains a "general conditions" section applicable to all contracts. It covers conditions which apply to everyone who has any connection with the particular job.

The American Institute of Architects, governmental agencies, and many private firms have their own standard printed "general conditions" forms which they apply to all of their jobs. This is fine when it works out, but our experience in construction for over forty years has been that every job has its own peculiarities. Thus, some slight variations in the general conditions covenants are necessary to make them apply to a specific job.

This is especially true if the company's operations are national. Lien laws and insurance requirements of the various states differ in many respects. Job conditions on one project may vary greatly from those for another. Your company will also have points which they will want covered from a policy and procedure standpoint.

It is a good idea, therefore, to have a format or standard outline of a general conditions section which can be given to specs writers working on a project for you. This will furnish them full and detailed information as to what you want, and they can edit this section to cover the particular job.

What should general conditions include? In the following paragraphs we will briefly outline this important section of the specs by the use of the standard headings which normally represent the individual clauses contained in the general conditions.

Part I. And Here's What Should Be Included

GENERAL. Under this heading should be given the name of the owner of the project, with its home office location by street address, city, county, and state; the name of the construction job covered by the specifications and its location by street address, city, county, and state. Also, it should be emphasized that the specs are intended to cover the work of all trades by any and all contractors, subcontractors, and materialmen, and that they will be revised or added to by written bulletins, if necessary.

Architects use different forms of amending specs. Sometimes a letter, in duplicate, with space for acknowledgment of the contractor is used. Figure 1 illustrates a simple printed form. In this form under "Intent" Paragraph 1 states why the bulletin is issued and what documents it corrects. Paragraphs 2, 3, and 4 outline the additions under underlined headings in a manner similar to the specifications. The bulletin should then be signed by an authorized person.

DEFINITIONS. There are certain words that reoccur in the specs, and these should be clearly defined. This will include words such as "owner," "architect," "engineer," "contractor," "subcontractor," "materialmen," "supplier," and "superintendent." In those cases where a specific individual is referred to, his name and title should be given. When the term may cover representatives of different contractors, such individuals should be named by title, such as the word "superintendent," by which is meant a superintendent, foreman, or any supervisor who is charged with the responsibility of representing a contractor on the job.

WORK TO BE PERFORMED. A brief bulletin should be included of what each contractor is expected to furnish with respect to work to be performed by him.

CONTRACTS. Outline what portions of the work covered by the various construction sections of the

specifications will be directly contracted for by the owner, if the owner intends to let separate contracts. This should be more clearly spelled out in a "letter of instruction" to the various bidders at the time that bids are solicited.

PROPOSALS. State exactly how the bidders' proposals should be submitted. This, too, can be more specifically covered later in a "letter of instruction" to the bidders. This is a good place to caution all bidders to thoroughly examine the plans and specifications; that if there is any obscurity as to the meaning of any parts of the specs they should ask for an explanation before submitting their bids. It is also a good place to state that the owner reserves the right to reject any and all proposals.

EXAMINATION OF PREMISES. Any peculiarities about the job should be clearly outlined, and all prospective contractors should be instructed to thoroughly examine the premises before submitting their proposals.

DRAWINGS. It is well to point out that the drawings and the specifications become a part of the contract covering each specific portion of work and that the tracings or reproducible prints are to be turned over to and become the property of the owner; also, any supplemental drawings issued in explanation of details or to cover job conditions will govern the work to be so performed.

SHOP DRAWINGS, SAMPLES. Point out that shop drawings should be submitted, how they should be prepared, the number of copies which are to be furnished for approval, as well as that approval of such drawings does not relieve the contractor from responsibility for deviations or errors. It should also be indicated that the contractor is to furnish samples in lieu of shop drawings when this is required.

ISSUER'S NAME

BULLETIN

covering

CHANGE IN SPECIFICATIONS AND/OR PLANS

Date Issued Sept. 10, 1957

Date Effective Sept. 20, 1957 Bulletin No. 1

Job Post Gen Mfg. Co., Plant and Office Buildings

Contract Plumbing

ENTER:

1. This bulletin is issued prior to receipt of bids to provide for modifications in plans and specifications. Acknowledgment of this bulletin shall be made and cost of work included in bidder's proposal.

ADDITIONAL FLOOR DRAIN - OFFICE - BASEMENT

2. Provide labor and material and install a floor drain under the landing of the rear stairs in southeast corner. Located 5'-0" east of east wall and 2'-0" north of south wall. Connect to sewer line along south wall. Have rod-out fitting to east end of run. It will serve future condensate pump to be set on floor.

ADDITIONAL FLOOR DRAIN - OFFICE - BASEMENT

3. Provide labor and material and install a floor drain in northeasterly area and connect to line serving two floor drains now shown on sheet #10 of plans. Terminate in general work call for waterproofing of future pertinent floor area. Install this drain similarly to other two and to take its share of area.

ADDITIONAL WATER CONNECTION - OFFICE - BASEMENT

4. Provide labor and material and extend from terminal of 1" C.W. line in southeast corner, a 3/4 C.W. line northwardly to vicinity of aforementioned floor drain, and terminate with a gate valve for use by heating contractor.

Issued by: _____

Fig. 1. Bulletin used to notify bidders of changes in plans or specifications after mailing but prior to receipt of bids

RECORD DRAWINGS. It is always a safe practice to request that each contractor maintain a master set of drawings on the job during the construction. On these drawings, his superintendent can note and detail deviations from the original plans so that the architect or engineer who prepared the drawings can correct the tracings to give the owner an "as built" set of drawings. Also, require reproducible negatives or tracings to be furnished on all shop or other drawings made during the course of the job, which become a permanent record in the file of the owner.

CONTRACTOR. State that the specifications have been divided into separate sections to cover various trades or materials of construction; that only one contractor will be recognized as the other party in any such specific trade contract; and that such prime contractor will be held fully responsible for all those working under his direction. This is a good place to indicate that such contractor operates as an independent contractor and not as an employee or agent of the owner. This last statement is particularly important in case of damage claims.

SUBCONTRACTOR. Indicate that the prime contractor is to sublet all work that he is not accustomed to perform or that the owner may approve; that he is fully responsible for the subcontractor's direction; that he is to notify the owner in writing of the names of all subcontractors and suppliers; and that nothing in the contract documents shall create any contractual relations between the subcontractor and the owner.

PROSECUTION OF WORK. All contractors and subcontractors should be cautioned to diligently prosecute the work to its earliest completion, or in its entirety, within a stated date if there is a time limit. Also state details if there is a time limit with a money damage penalty for delays.

LINES AND GRADES. Outline who is to furnish the plat of survey showing metes and bounds and elevations and what other drawings may be furnished to establish similar data. It is well to state that the owner does not accept any responsibility for the authenticity of such information and that this information is being furnished as it may be helpful to the respective contractors, also that a contractor will be held responsible for the construction of all his work to the lines, grades, and elevations shown on the construction drawings and indicated in the specifications.

PERMITS. Set forth the responsibility of the owner, the prime contractors, and the subcontractors with reference to building permits, special city council orders or ordinances, required public notices, and any other permits and licenses that may be required; also, that the contractors shall strictly comply with all governing laws, rules, regulations, and inspection requirements and pay all fees in connection therewith.

UTILITIES FOR CONSTRUCTION. Spell out who is responsible for securing utility services during construction. This would include water, sewer connection for temporary toilet facilities, electricity, telephone service, and any other similar utility services that may be required during the course of the job and by the owner after the job is completed.

If the new construction is adjacent to or within an existing structure, many times the owner will state

"You, as the plant engineer, should know what constitutes a good set of specs, so you can outline what results are desired."

that certain of these utilities will be furnished to the contractor during construction at no cost to him. Also, point out that all temporary facilities in the way of pipes, wires, fixtures, etc., as well as any connections to owner's facilities, shall be removed to the owner's satisfaction and at the contractor's expense on the completion of the respective contractor's work.

MATERIALS AND WORKMANSHIP. It is always advisable to indicate whether or not all materials are to be new or whether salvaged materials may be incorporated in the construction. Outline the quality of materials and cover the substitution of materials by specified trade name or manufacture. Charge the contractor with furnishing satisfactory evidence of quality for any substitution he may propose. Require that workmanship must be first-class in all respects, and specify that such words as "of best quality," "approved equal," "as approved," or similar terms mean that the owner or its representative will determine which is the best and most suitable material. The terms, such as "as directed" and "selected" imply selection by the owner or his representative.

SUPERINTENDENT AND WORKMEN. A contractor should always give personal supervision and direction to the work, and he should keep a superintendent who is satisfactory to the owner constantly on the premises while the work is in progress. Superintendents shall have full authority to carry out the instructions of the owner or its representative promptly and they represent the contractor in the contractor's absence. The contractor should be required to employ only skilled and reliable workmen.

INSPECTION. The contractor shall provide safe and proper facilities for inspection of construction by the owner or its representative or by any other outside agency. Here it should be pointed out that any payments on account which have been made shall not relieve the contractor from responsibility to remedy any defective work or materials.

COMPLIANCE. Any portion of the job which is not completed in compliance with plans and specs should be remedied and properly rebuilt by the contractor at his own expense. If the contractor does not do so upon written request, the owner may cause this work to be removed and properly done and deduct the cost from monies due the contractor.

PROTECTION SAFETY. This public health and safety heading is very important, and under it must be spelled out the responsibility of the contractor to protect his workmen and the public from injury. He alone is responsible for such protection and for the injury of persons or to property and that he should perform his work in accordance with best standard safety precautions, not necessarily limited to labor laws and regulations. If the contractor fails in the judgment of the owner to provide adequate protection, such protection may be provided, or damage by contractor may be repaired, by the owner and the cost deducted from the monies due the contractor.

COMPENSATION INSURANCE. The carrying of workmen's compensation insurance invariably is regulated by state statutes, but under this heading it is well to definitely outline the contractor's responsibility for covering his employees and to see that his subcontractors working under his guidance also carry such protection in the statutory amounts.

INDEMNITY TO OWNER. Recently it has become the vogue with larger corporations to include a hold-harmless clause in contracts and purchase orders involving contractors that provide labor and materials in connection with a job. Under such a clause a contractor defends, saves, holds free and harmless, and indemnifies the owner, its employees and agents for any and all expense, damages, claims, or causes of action which may at any time arise in connection with the performance of the work being done, whether attributable to the fault, failure, or neglect of the owner, its employees and agents, or otherwise.

The above outlines a broad form of hold-harmless clause, and may not be acceptable in all cases. Consultation with your public liability insurance carrier or with your legal counsel will help you to decide and give you the proper language for this clause.

PUBLIC LIABILITY AND DAMAGE. Spell out the contractor's obligations for securing public liability and bodily injury coverages. The limits of such coverage should be stated, and a contractual liability endorsement covering the obligations of the contractor outlined immediately above under "Indemnity to Owner" should be requested. A request for a photostatic or certified copy of such endorsement to the contractor's liability policy should also be made indicating that the required contractual coverages apply to the work outlined in the specifications.

A certificate of insurance indicating that the insurance required in the specifications is in effect, with a clause providing that the insurance company will give the owner not less than ten days' written notice prior to cancellation of or material change in such insurance should also be requested from the contractors. A statement should be included that the prime contractor shall require each of his subcontractors to carry the same insurance and that he shall require evidence of insurance coverage. **End Part I**

Watch for Parts II, III, IV, and V

Section II outlines requirements for taxes, payments, waivers of liens, arbitration, and guarantees.

Section III tells how to select bidders, instructions on bidding, and proposal forms.

Section IV covers analyzing bids, agreement forms, and signing the contract.

Section V discusses the problems that arise in the field during the construction period, progress reports, final inspection, and obtaining approval of completed work.

Testimonial for Preventive Maintenance
84,000 Troublefree Compressor Hours

By D. R. LOHSE, Application Engineer and
GEORGE MILLS, Service Manager, both of Joy Manufacturing Co.

YOUR plant compressor is capable of running for well over 84,000 hours without a breakdown or major overhaul. This is over four and one-half years, and yet it is just one of the records we have on compressors that have been receiving preventive maintenance and turning in outstanding performance records. Preventive maintenance can do the same for you, and here is how to achieve it.

First, and probably most important, give somebody responsibility for the machine who is completely familiar with its operation. It is not adequate to have the first person arriving in the morning start the machine and the last person leaving at night stop it. A mechanic who is thoroughly familiar with the machine can spot trouble the minute it starts to happen, much as a seasoned driver recognizes engine trouble by the way his car reacts.

The second step in preventive maintenance is to practice good housekeeping. Aside from the fact that it makes the compressor look good, cleaning can add years to the life of your equipment. Dirt and other foreign material that gathers on the outside of the machine can cover up mechanical defects, such as a loosened bolt or connection. A daily wiping with a cloth will show up these potential trouble spots.

On air-cooled units, dirt on the outside of the machine also tends to act as an insulating blanket; thus the temperatures inside the machine get a great deal higher than they should. Excessive heat promotes wear and tear on moving parts.

One of the most important tools of a preventive maintenance program is a daily log. This one records pressures and temperatures in the compressor and its lube system; air and water temperatures in the compressor and in the aftercooler

Dirt also works into the lubricating system, where it impairs oil circulation, causing much higher wear rates on gears, bearings, cylinder walls, and piston rings.

The amount of dirt that can enter the compressor through the air intakes is surprising; yet, this is often overlooked in maintaining a compressor. Some operators don't bother to clean the air filter regularly, use the wrong filter, or even neglect to put a filter on.

We mentioned earlier in the article how a man trained in the operation of the machine can save you time, trouble and money by spotting problems before they arise. One of the most effective ways of doing this is through regular reading of the gages on the machine. If the operator is familiar with the readings that are "par" for normal operation, he knows right away when a problem exists. An increase of the intercooler pressure reading, for example, usually means something is not right with the high pressure cylinder valves; while a low intercooler pressure reading usually means malfunctioning valves in the low pressure cylinder, or a dirty intake filter.

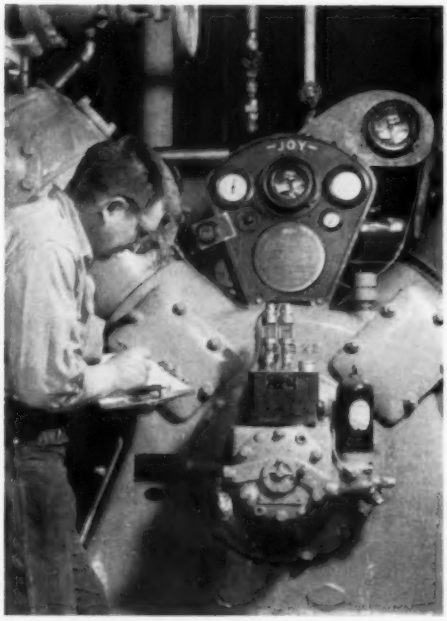
Since dirt is probably the greatest enemy of a compressor, it makes sense to be sure that the compressor lube oil is clean. This means that the oil should be changed on a regular schedule. This schedule can vary, however, from machine to machine and from one operating condition to another. Obviously, oil used in a compressor with an airtight crankcase requires less frequent changing than that in compressors that permit air to enter.

The importance of using the proper lubricant for the machine cannot be overemphasized.

While attention to cleanliness and to the gages prevents most trouble,

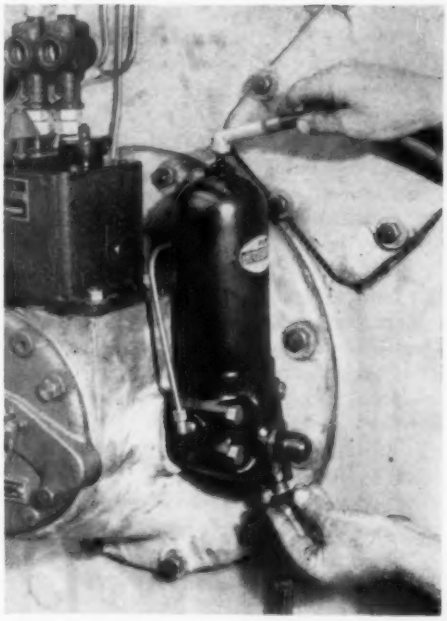
Every 8 hours . . .

Check oil level in crankcase and lubricator; add oil as needed.
Wipe entire machine with a clean cloth.



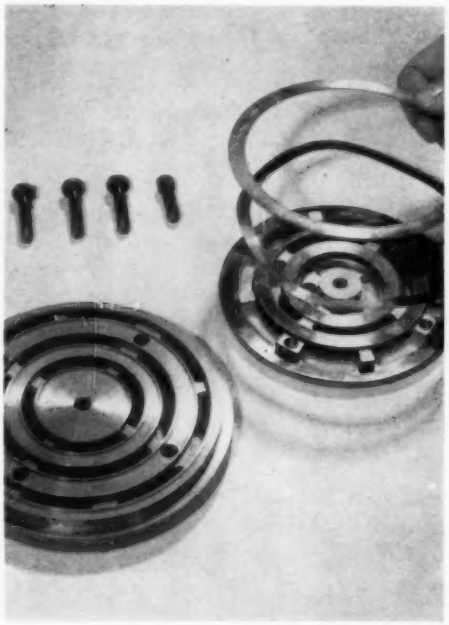
Every 500 hours . . .

Drain and blow out oil filter.



Every 1000 hours . . .

Remove and check valves and springs for wear and carbon formation.
Disassemble and clean oil filter.
Wash filter element in solvent.



Every 2000 hours . . .

Drain crankcase; clean with kerosene.
Refill crankcase with oil.
Clean strainer.

it also is advisable to make a visual inspection of the valves every 1000 hours. This takes a very short time, and can be done without prolonged or serious interruption of the production schedule. If visual inspection reveals a cracked or chipped valve, make sure that the valve seat is in good condition or the replacement valve will soon fail.

It is best to set a fixed schedule for checking the oil and the valves, making the procedure as mechanical as possible. Maintaining a daily log of operations, such as gage readings, hours of running and maintenance, makes the procedure easy.

So far, we have been talking about preventive maintenance of continuous-operation, heavy-duty compressors. There is a difference in maintaining an intermittently-operated machine—not so much in procedure as in degree.

For one thing, these machines are usually not as heavily constructed and run at much higher speeds. There is a tendency, therefore, for parts to work loose. Moreover, the valves require more frequent visual inspection because they cycle faster and hotter.

Here the necessity of good housecleaning is doubly important since units of this type are usually air cooled. Dirt and grime on the machine will cause excessive heat.

In summary, preventive maintenance of industrial air compressors means:

1. Assign responsibility to an employee who is familiar with the machine.
2. Maintain good housekeeping.
   a. Clean the compressor exterior once a day.
   b. Make sure the air filter and air intakes are proper for the job—and cleaned regularly.
3. Take frequent readings of the pressure gages and thermometers. Keep a log if possible.
4. Change the oil when needed.
   a. Check and clean oil filter every 2000 hours.
   b. Always use the proper type and grade of oil.
5. Make a visual inspection of the valves every 1000 hours.
   a. Be sure that valve seats are OK.
6. For intermittent-operating compressors, follow above steps more frequently.

If compressor downtime means money to you, a few minutes each day will insure against breakdowns and major, time-consuming overhauls. The compressor mentioned earlier in the article has been running without trouble for 84,515 hours and five minutes, at the time this article was written. With a continuing program of preventive maintenance, it will last a great deal longer than that. **End**

Compressor Troubleshooting Chart

If, despite your best efforts, things start going wrong with your compressor, consider these symptoms and the places to look for probable causes of each.

1. Low Oil Pressure
   a. Low oil level
   b. Plugged suction strainer
   c. Leak in the suction or pressure lines
   d. Worn bearings
   e. Malfunctioning oil pump
   f. Dirt in the check valve
   g. Broken spring in the check valve
2. High Oil Pressure
   a. Plugged oil pressure line
   b. Excessive spring tension on the check valve
   c. Malfunctioning filter
3. Incorrect Delivery of Lubricator
   a. Dirty or gummed lubricator valves
   b. Broken spring or dirt in the check valve at the cylinder head
   c. Leak in lines or in the sight feed
   d. Low oil level
   e. Plugged vent in lubricator reservoir
4. Overheated Cylinder
   a. Insufficient cooling water
   b. Scored piston or liner
   c. Broken discharge valves or valve springs
   d. Excessive carbon deposits
   e. Rod packing is too tight
   f. Insufficient lubrication
   g. Deposits of foreign material in the cooling jackets
5. Water in Cylinders
   a. Leak in the head gaskets
   b. Cracked cylinder head
   c. Condensate—caused by the cooling water being too cold, or flowing when machine is stopped
6. Incorrect Operation of Unloader
   a. Foreign material in the guides or seats
   b. Worn plunger seal or diaphragm
   c. Broken spring
7. Knocks
   a. Excessive carbon deposits in cylinder
   b. Scored cylinder liner
   c. Faulty lubricator
   d. Incorrect head clearance
   e. Loose piston
   f. Burned or worn rod bearings
   g. Worn or scored crosshead liner or crosshead
8. Scored Cylinder Liner and Piston
   a. Foreign material in intake
   b. Lack of lubrication
   c. Incorrect cooling—too cold. Condensate washes away lubrication
   d. Excessive heat
   e. Plugged water jackets
9. Broken Valves and Springs (Excessive)
   a. Insufficient lubrication
   b. Rust
   c. Condensation
   d. Carbon deposits
   e. Foreign material
   f. Incorrect assembly

Chiller Minimizes Cooling Water Usage

Extracting Heat From Closed-Loop System Permits Re-Use

By **FRED SAVAGLIO**, Plant Manager, Drayer-Hanson Division, Los Angeles, California

COST SAVINGS are always important, but actual money saved ranks second in many Southern California water conservation projects. All industries in this area are keenly aware that a water shortage can become a critical factor.

It was largely to insure against such a water shortage that we decided to install a water chiller and a circulating water system to cool two large resistance welders. In addition, the water could easily be treated against calcium and other scaling deposits which gradually deteriorate the efficiency of any cooling system. Finally, of course, actual money would be saved by re-using the water instead of discharging it down a drain.

Two 150-kva resistance welders, operating 16 hours a day, five days a week, are cooled by the installation. Water is used to cool the machine bearings, welding wheels, transformers and the ignitron power tubes. Prior to the installation of the water chiller, approximately 70,000 gallons of water were used each month to cool the welders.

The three-ton, air-cooled condensor type chiller uses a 3-hp motor for the compressor and a ¼-hp motor for the fan. The heat exchanger consists of seven, water-carrying, copper tubes running inside a 2½-in. steel tube containing Freon 22. The water circulates from the resistance welders directly through the copper tubing in the Freon cooling element and then into a surge tank.

Provided with a water purifying system, the surge tank removes calcium and other scale forming materials. A float valve admits the small amount of make-up water needed to keep the system full.

Installed outside the building, the chiller is piped through the building wall to the resistance welders located just inside the wall. The surge tank is located inside near the welders.

Controls include a Freezestat to prevent freezing of the water, a high and low pressure control, and a built-in switch for the water circulating pump. Included are a thermal expansion valve, a liquid line sight glass for the Freon and a dryer and strainer for refrigerant.

Cost of the installation was approximately $2000 with the chiller figured at cost price. This cost would be somewhat higher if the unit were purchased commercially. Life expectancy on all the operating and moving parts is around 10 years.

Only routine maintenance is required. This includes monthly additions of slow dissolving chemicals to the water purifying system. The three-ton capacity of the chiller has proved ample for the two large resistance welders, even when operating at top speed under unfavorable ambient temperatures. **End**

Hot-dip galvanizing permits outside installation. Warm air is exhausted vertically

Test Your V-Belt Know-how

Answers Will Help Prolong Belt Life, Increase Efficiency

By **FRANK H. RUMBLE**, Allis-Chalmers Mfg. Co.

YOU CAN TEST your V-belt drive know-how in a few minutes by checking these statements true or false. Using the advice included with the answers will also help in prolonging the life of the V-belts in service in your plant and increase the efficiency of the drives. The answers are applicable to all types of V-belts manufactured today.

Try the test on your maintenance men, too. If their answers indicate incomplete knowledge of V-belt drives, it could result in some dollar-saving educational value.

Because of its shape a V-belt requires less tension than a flat or round belt.

True. But not because a v-shape is more pleasing to the eye. A mechanical principle is involved. It is the wedging contact made between the sides of the v-shaped belt and the sides of the v-shaped sheave groove that gives a V-belt its grip. Because of this wedging action, a V-belt requires less tension than round or flat belts which depend on frictional contact for grip.

A V-belt should fit into and completely fill a proper sheave groove with the bottom of the belt riding lightly on the bottom of the sheave groove.

False. The bottom of a V-belt should *never* touch the bottom of a sheave groove on a single or multiple V-belt drive. If the bottom of the belt touches the bottom of the groove, even slightly, less wedging action results and the drive is less efficient. There should always be space between the bottom of the belt and the bottom of the sheave groove. If belts ever become worn to the point where they "bottom" in the grooves, they should be replaced without delay.

A drop or two of oil or belt dressing on the sides of V-belts will give them greater grip and make them last longer.

False. Oil and belt dressing should never be used on V-belts. Foreign substances of any kind weaken the grip. Due to their gripping contact, belts operate best when the belts and sheave grooves are smooth and dry. Oil is deteriorating to a V-belt unless the belt is of the oil-resisting type (neoprene).

It is injurious to stretch V-belts.

False. Provided the stretching is done when the belts are in use. Research and experience have shown that V-belts operate best when under slight stretch, which is, of course, induced by putting them under proper tension. That's why V-belts are made resilient and elastic—a necessary attribute of V-belts working in multiple.

When one belt in a multiple V-belt drive fails, it should be replaced with a new belt immediately.

False. On two counts. If a multiple V-belt drive has been engineered properly to start with, the drive may continue to operate for a time with one or more belts missing. However, the remaining belts will have reduced overload capacity and may fail at a critical or inconvenient time. The full complement of belts should be restored at first opportunity.

When one or more belts need replacing, a complete matched set should be installed. This is why: When new belts are placed in use with older belts which have been stretched in use, the new belts being shorter will bear more than their share of the load. This uneven loading will lead to premature failure of the new belts.

A V-belt drive should be "taken-up" every 30 days whether it needs it or not.

False. V-belts which have been tensioned properly after the "breaking in" period, will retain the tension for a considerable time. They may require infrequent re-tensioning. However, it is advisable to inspect the drive once a month to see that everything is all right. Regular inspection check-up, at intervals of one month or more, establishes a good habit and assures observance of a money- and trouble-saving maintenance program.

The center distance (distance between sheaves) of a V-belt drive does not affect its efficiency.

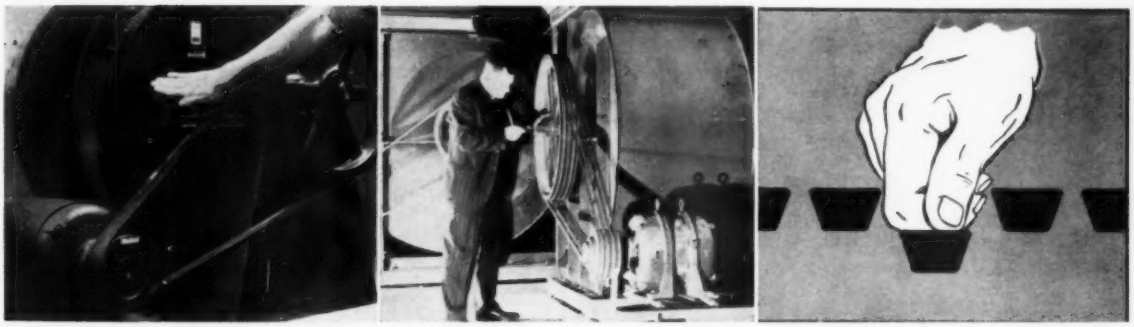
True. Center distances, within practical limits, may be as short or as long as conditions dictate. If belts are kept tensioned properly, a long center drive will operate satisfactorily. But remember, the V-belt drive is inherently a short-center drive. You'll get best results when centers are as short as practicable. The ideal center distance lies between 1 and 1½ times the diameter of the large sheave. Short belts cost less and require less maintenance.

There is no definite way to determine whether the belts in a multiple V-belt drive have enough tension.

False. While it is impractical in the average shop to actually measure the *amount* of tension, such as could be done in a laboratory with special equipment, *exact* measurement is not necessary. It is sufficient to have practical means of *approximating* the proper tension. There are three *practical* methods in use by V-belt drive maintenance men.

An experienced operator can tell by sight and feel whether or not a set of belts is under proper tension. Unless the drive has an unusually long center distance, the belts will have little or no sag. A slack V-belt feels "dead" when slapped with the palm of the hand. A properly taut belt has an alive springiness. The proper "feel" is soon learned by experience.

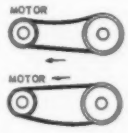
Or, you can use a tachometer. After a set of belts has been installed and the slack removed, the revolutions per minute of the driven shaft can be checked with the revolutions per minute of the driver shaft (according to speed ratio) with a tachometer. Tension should be applied only to the point where no appreciable slippage of belts under full load is evident. The revolutions per minute of the shafts should be checked every few days until the belts are broken in and seated properly.



There are three practical methods of approximating proper belt tension. One is to check the belt's liveliness by slapping it with the palm of the hand, left; another, is by the use of a tachometer, center; or, by depressing belt, right

A method favored by many operators is to depress the belt. With the drive stopped, press down on each belt individually. A belt which can be depressed with reasonable pressure an amount equal to its own thickness for each 48 in. of unsupported length is properly tensioned.

The tight or tension side of a V-belt should always be on top.



False. When a V-belt drive has proper tension on the belts it does not matter which direction the drive is run. It may be started, stopped and reversed as easily as a motor. Consequently, the tension side can be either at top or bottom of a horizontal drive, depending on which direction the drive shaft must turn. Where there is a choice of having the tension on either the top or bottom side, two considerations govern. One is appearance. A drive with the tight or tension side on top, looks better to the casual observer. Purely from the standpoint of efficiency, however, it is perhaps better to have the tension side at the bottom so as to avoid lessening the arc of contact on the sheaves in even the slightest degree.

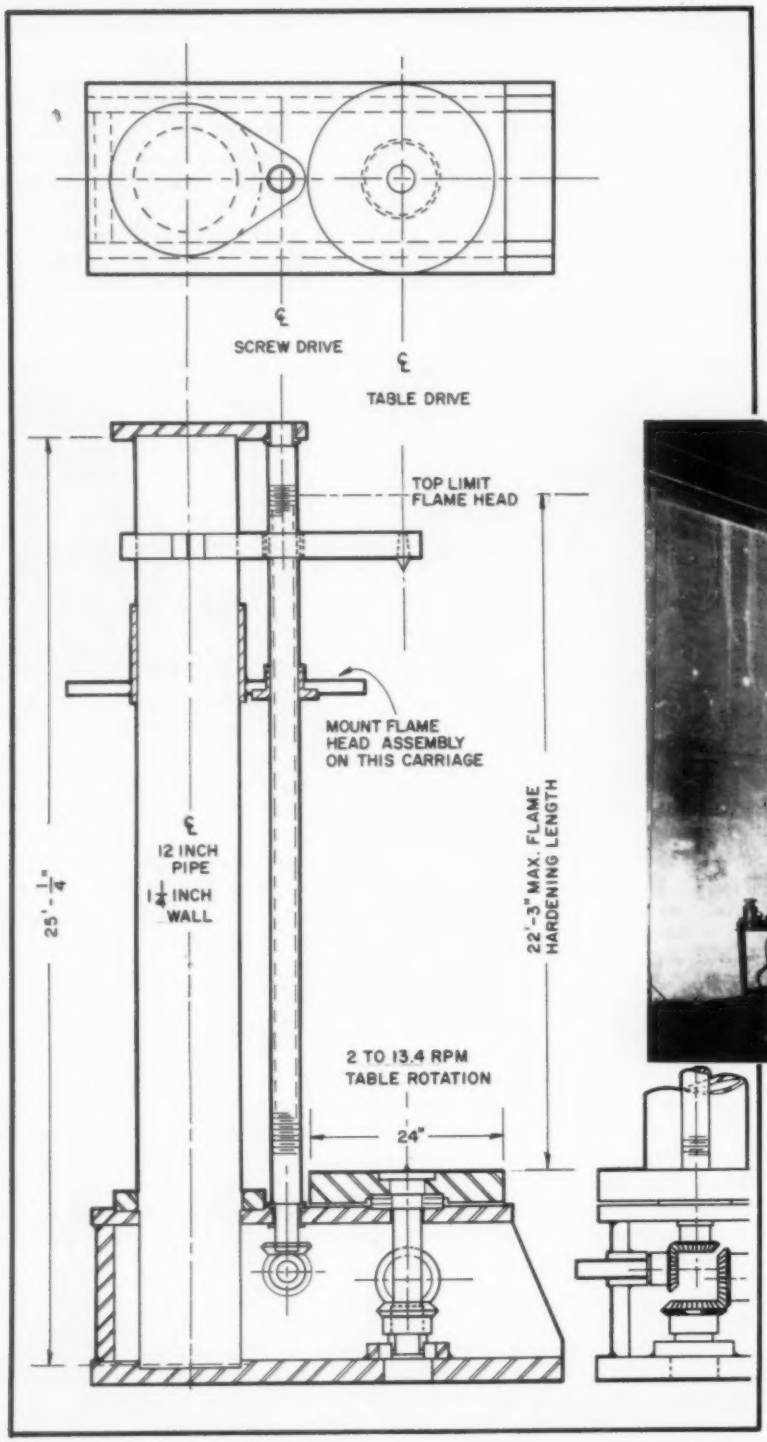
If V-belts are too loose they may break more quickly than if they are too tight.

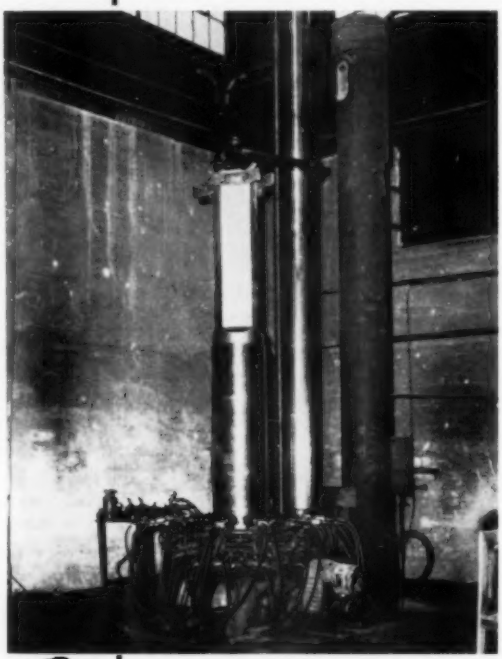
True. V-belts are tough, but they were not designed to play "crack-the-whip." Any extra slack in a V-belt is apt to be taken up suddenly (with a jerk), particularly when starting the drive or under sudden peak loads. This sudden jerk on a slack belt may snap it, just as a slack string is more easily snapped than a tight one. Best preventive is to keep slack out of V-belts on a drive by having them properly tensioned. **End**

Flame-Hardening Machine—
Plant Engineering Department Designed and Built It

BECAUSE OF THE ever-increasing trend toward flame-hardened forged steel shafting and rolls, we installed a new flame-hardening machine with the capacity for processing larger and heavier forgings than had been possible before.

This machine was designed and built by the plant engineering department. It has the capacity for shafting and other symmetrical parts up to 22 in. in diameter by 22 ft long without having to turn

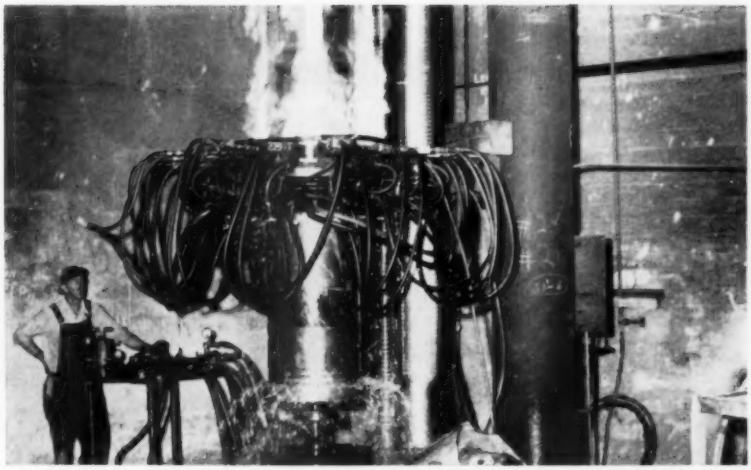




Above: Overall view of the flame hardening machine which was designed and built by the plant engineering department. Machine handles workpieces up to 22 in. in diameter by 22 ft long

Left: Diagram shows the essential parts of the flame hardening machine. Workpieces can be rotated at speeds of between 500 and 1000 surface inches per minute while flame traverses work at speed of 2 to 13.4 in. per minute

By R. A. BUTLER,
Plant Engineer,
Struthers Wells Corp.



In operation, a ring of intense oxyacetylene flame, 5600 F, moves upward around part. The quenching medium—usually water—follows at a very close distance

them end for end, which is the usual procedure on smaller machines.

Since standard machines of the desired capacity were not available at the time we needed the equipment, we decided to make our own. Upon surveying the requirements as to size, speeds, gas consumption and other pertinent data, we realized that all we had to do would be to devise a means for supporting and rotating the work.

The size of the machine governed the maximum fuel consumption and this, in turn, served as a guide to investigate the capacity of the plant's oxyacetylene cascade and generator system and the sizing of gas supply lines to the machine site.

Work Handled Vertically

In order that any distortion would be negligible, particularly in flame hardening long slender shafts, the machine was designed for all work to be set up vertically and to use the spinning and progressive hardening method.

By this method the work is rotated on its axis at varying speeds up to 120 rpm while a ring of intense oxyacetylene flame, 5600 F, moves uniformly upward around the part. The quenching medium—usually water—follows immediately behind at a distance of about ½ to ¾ of an inch so that almost as soon as the surface approaches 1650 F—at which temperature it appears a dull red—it is quenched black. The work size, hardness and depth of case desired determines the shaft revolution and the travel rate of the flame ring which is adjustable from 1.8 in. to 12.8 in. per minute. It can also be adjusted to suit any work diameter up to 22 in. and is made up of a cluster of Linde 30-flame heating heads with No. 56 tips manifolded to W-43 blow pipes.

After several design sketches which provided a general idea of the material requirements, we checked our maintenance stock of used variable speed reducers, gears and other items which might be suitable for possible use.

The base of the machine was fabricated as a weldment and designed and built around the various major components found in stock. A length of 12 in. Schedule 140 pipe constitutes the column, while a feed screw from an idle engine lathe, miter gears, bearings and a pair of variable speed reducers comprise the balance of the machine elements.

A brief explanation of the reason for using two motors and what part they play in the mechanism may be of interest to some readers.

The table or face plate which rotates the work being hardened is powered by a 16½ to 114 rpm variable speed drive unit through a pair of miter gears underneath the table.

While the work is rotating on its axis, the flame ring traverses the part to be hardened. A nut in the flame ring assembly is engaged with the vertical screw and this screw is powered separately by its own 2 to 13.4 rpm variable speed reducer.

The two motors are used because of the great differential in speeds required. Independent speed control of these two functions is necessary to achieve a certain hardness and/or depth of hardness on all sizes of shafts for which the machine has capacity. In other words, the work must be rotated, depending on several factors, at a speed somewhere between 500 and 1000 surface inches per minute while the flame traverses the work depending on the desired hardness, material, etc., at speeds ranging from 2 to 13.4 in. per minute.

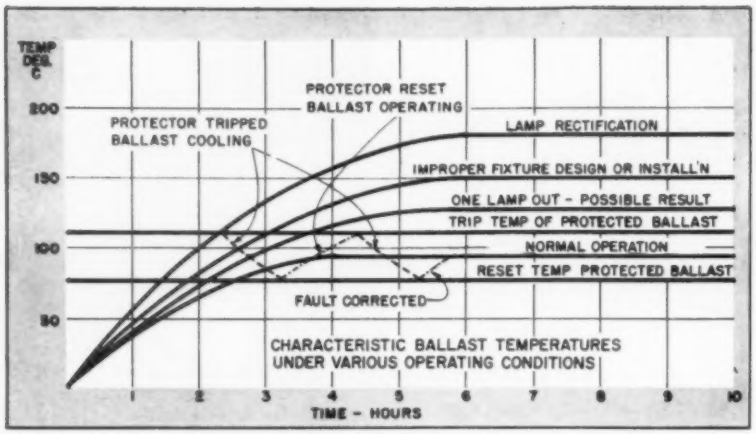
Steels up to 0.80 per cent carbon may be hardened as well as low and high alloy steels although the low alloy material should contain less than 2 per cent total alloying elements. Otherwise, certain precautions are necessary. Steels below 0.40 per cent carbon will not harden to about 450 Brinell but certain stainless steel may be hardened to 500 or 600 Brinell.

What Machine Can Do

With the flame hardening operations always accomplished under competent metallurgical control, the depth of case is accurately maintained and the hardness tolerance is well within five points. Indeed, it is possible to produce higher surface hardness in certain materials and somewhat more simply than can be obtained by other treating methods. In addition, the oxyacetylene flame tends to afford protection against scaling of the surface which often is at a critical dimension.

Admittedly the machine lacks some refinements as to automatic and electronic speed control devices but, nevertheless, the necessary accuracy, temperature control and speed range is built in. Because of the capacity of this equipment we have been able to flame-harden to precise and uniform hardness tolerances many hundreds of tons of steel forgings. **End**

Early ballast failures can be very costly . . . Frequently it costs as much to replace a burned-out ballast as it did to purchase the fixture originally . . . Here are some reasons for the failures and what you can do about it



How To Stop Ballast Failures

Temperature-Sensitive Switch Controls Heat, Extends Life

DURING the last few years the demand has grown for fluorescent fixtures that are very shallow. At the same time, the currents handled by the ballast have been increased. Both changes have raised the normal operating temperatures of the ballast and reduced the margin of safety needed to handle an abnormal situation.

All ballasts today operate at coil temperatures of 90 to 100 C. The insulation of the coils is Class A with an operating limit of 105 C. This gives a maximum reserve of only 15 C for abnormal conditions.

There are several abnormal conditions that can cause ballast overheating. Failure of one lamp in a fixture causes high temperatures in some ballasts. Some lamps act as rectifiers shortly after half life and this action can cause coil temperatures in the ballast as high as 180 C. Improper design or installation of the fixture can raise operating temperatures of the ballast coils from a few degrees above normal to 150 C.

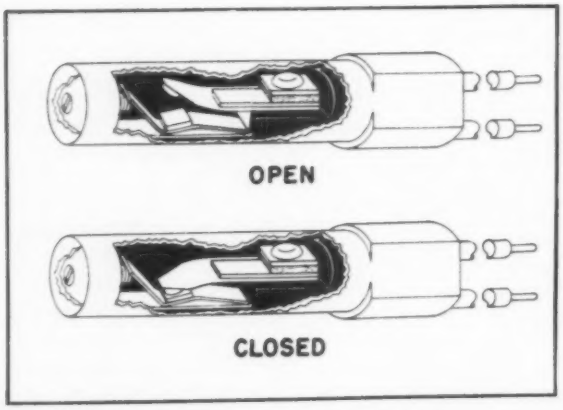
When lamps reach end of life, ballast coil temperatures may increase as much as 90 C. The normal life of a ballast is about 12 years or roughly equivalent to a minimum of the combined lives of five normally operated lamps.

Ballasts that are thermally protected against overheating by a built-in overheat protector are now commercially available. The protector, manufactured by the Spencer Thermostat Division of Metals and Controls Corporation, Attleboro, Mass., is sensitive to both winding temperature and current and will prevent coil temperatures from exceeding 120 C.

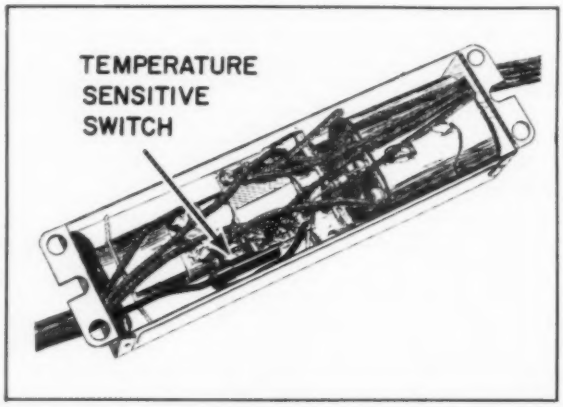
Under normal operating conditions in a 40 C ambient, the protector allows the winding temperature to reach 105 C minimum without opening circuit to primary winding. After opening, protector will not reclose above 85 C. **End**

Additional Information

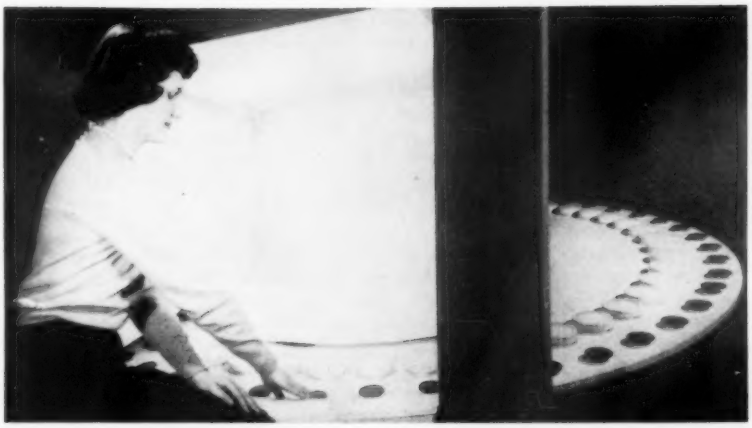
If you would like more information about ballast protectors, write to the Editor, Plant Engineering, 308 E. James St., Barrington, Ill., or indicate "Ballast Protector" on post card in issue.



Heat, radiated from ballast coil or generated from current flow through switch, opens contacts to protect the ballast



Temperature-sensitive switch is laid against ballast coil and wired into circuit before potting compound is poured



Simulator permits observation of time required for the operator to make a decision to pass or reject a part under closely controlled speed, various lighting conditions

How Do We See?

Vision Research Improves Design of Lighting Systems

LIGHTING engineers and professors joined together recently at the University of Michigan to present a three day program "Light and Vision." A better understanding of how we see has resulted from over 10,000,000 observations made by 40 members of the Vision Research Institute Staff at a cost of $1,500,000.

An example of this fundamental research is the field task simulator designed to duplicate seeing tasks found on continuous process lines. The operator is required to examine each of 50 small discs which move rapidly across the field of view when the large wheel rotates. Some discs have small spots of light, projected from below, to represent imperfections. The operator identifies the discs having these imperfections by pressing the gray button adjacent to the disc.

The speed of rotation and the lighting level in the booth can be varied to simulate various actual field conditions. Recognizing the importance of this work, construction of the simulator has been supported by the Illuminating Engineering Society.

This and other equipment designed to accurately measure the threshold of vision have resulted in generally higher footcandle recommendations based on the difficulty of the seeing task. There are many factors to consider when planning a lighting installation. Six speakers have prepared the following condensations of their talks covering some of these other factors.

A complete transcript of the proceedings of the conference will be available shortly. For further information please contact Mr. H. E. Miller, Director, Continued Education, School of Public Health, University of Michigan, Ann Arbor, Michigan.

Four Factors of Seeing

By Floyd Sell, The Detroit Edison Company, Detroit, Mich.

SIZE—Reading the headline of a newspaper is a very simple and easy task even in a very dim light. However, studying the classified-ad section is quite a different story, and size of the type makes that difference. Comparable seeing tasks in industry might be that of reading a micrometer caliper as compared to sorting large castings. These are extremes, of course, but many manufacturing, assembly and inspection jobs have this element of size which must be reckoned with by providing a large amount of light. The low visibility of small objects can, within limits, be compensated for by supplying higher intensities of light.

REFLECTANCE—In general, it is easier to see those objects which reflect the most light. In industry, the task of inspecting dark case-hardened steel screws as compared to inspecting aluminum screws is an example of these differences in reflectance. Here again, more light on the dark object provides a compensating factor in visibility making it easier to see.

CONTRAST—When plating nickel on copper, the areas of copper not covered by the nickel are easy to see because of high contrast. Incomplete coverage of chrome on nickel, however, is difficult to detect because of very low contrast. To be easily seen, the details of the object must differ in reflectance or color from the surrounding background. This can be accomplished in some cases by putting more light on the work or using special lighting techniques.

TIME—This element of seeing is involved in many inspection operations where minute flaws have to be detected at a glance, and the defective part rejected. It is also involved in the quick comprehension of situations necessary to avoid an accident. It takes time to see and, within limits, the time required can be reduced by providing more light.

Visual Comfort in the Plant

By William H. Kahler, Lighting Division, Westinghouse Electric Corporation, Cleveland, Ohio

GLARE may be defined as any brightness within the field of vision of such character to cause discomfort, annoyance, interference with vision, or eye fatigue. When the condi-

tion is caused directly by the source of lighting, whether natural or artificial, it is described as direct glare.

Most industrial applications call for either the direct or semi-direct types of luminaires. These should direct some light to illuminate the ceiling or upper structure. Upward light reduces the dungeon effect of direct lighting and creates a more comfortable and cheerful environment. Industrial luminaires are now available with upward components for fluorescent, mercury and filament lamps.

Top openings in luminaires will minimize dirt collection on the reflector and lamp because a draft path moves the dirt particles upward, and through the luminaire to the outer air. This requirement for ventilation is another reason for selecting upward component luminaires.

Reflected glare is caused by the reflection of high brightness light sources from shiny surfaces. In manufacturing processes this may be a particularly serious problem where critical seeing is involved with highly polished work surfaces such as polished sheet metal, vernier scales, and machined metal surfaces.

Reflected glare can be minimized or eliminated by using low brightness light sources or by orienting the work so reflections are not directed in the normal line of vision.

Light and Comfort

By Sylvester K. Guth, Manager, Radiant Effects Laboratory, General Electric Company, Nela Park, Cleveland

PROVIDING light for seeing involves more than merely illuminating a task. We work in, and hence must deal with, the entire visual environment and all pertinent factors must be considered in order to make the environment visually desirable. Achieving lighting with comfort involves consideration of the brightness relationships between the task and its immediate surroundings and the brightness of more remote regions such as luminaires and windows.

As a general guide, a characteristic of high quality lighting is that objects and areas which should not be seen are as inconspicuous as possible. At least their visibilities should be such that they do not compete significantly with that of the task or work being performed.

This can be accomplished by keeping the brightness ratios between the work and the surrounding areas as low as possible, preferably less than a ratio of three to one. While the matter of discomfort glare from luminaires is somewhat complex, available information in the form of visual comfort index tables provides a useful guide for selecting lighting equipment which will maintain the proper brightness balances for efficient and comfortable seeing.

Lighting Maintenance

By Carlton M. Holden, Manager, Commercial Engineering Department, Champion Lamp Works, Lynn, Mass.

FLUORESCENT fixture ballasts afford the best opportunity to meet price competition. Poor quality iron, less wire, insufficient insulation, and poor general quality all help to lower ballast costs. To the user, these factors mean more heat generated by the ballast causing premature failures. This also results in lower efficiencies and more frequent lamp replacements.

Fixture finishes that deteriorate rapidly or will not clean properly can be used. Parts that will not stand up under normal service are often employed. All of these factors mean an increase in maintenance costs that generally far exceed the original price savings.

Leaving burned out lamps in the fixtures under the impression that labor costs are being reduced can cost more in the long run. By doing this, ballast life may be reduced as much as 50 per cent. You can replace a great many lamps for what it will cost to replace a single ballast.

Long life incandescent lamps should be carefully considered before they are used. The labor savings they offer, in most cases, is absorbed by their lower efficiency and reduced light output.

When lighting equipment is purchased, you can not afford to consider only initial costs or you will fail to see the many other cost aspects involved. It is necessary to look at the total cost of producing light so that initial costs assumes its appropriate relationship to installation, maintenance and power costs.

Visual Comfort in the Office

By John J. Neidhart, Manager, Application Engineering, The Miller Company, Meriden, Connecticut

WE NOW HAVE in the 1965 I. E. S. Recommended Practice for Office Lighting a practical means of designing comfortable lighting installations that will prevent the unwary from going astray without unduly restricting the experienced designer.

Comfortable brightness relationships in the visual field can be obtained by observing recommended reflectances and finishes on all room surfaces and equipment, controlling daylight brightnesses, and selecting lighting equipment with a satisfactory brightness distribution.

A new method of specifying luminaire brightness is presented. It is based upon the use of the average brightness as the primary criterion instead of the less significant maximum brightness or brightness per square inch which has been used in the past. Average brightness is the candlepower at a given angle divided by the projected area of the luminaire at that angle.

Suggested brightness limitations recognize the fact that brightnesses must be lower at angles near the line of sight than at angles removed from the line of sight. They are somewhat flexible in that they permit different brightness distributions ranging from a uniform 250 footlamberts at all angles in the direct glare zone to one ranging from 165 footlamberts at 85 degrees from the vertical to 750 footlamberts at 45 degrees.

Lighting in Hazardous Areas

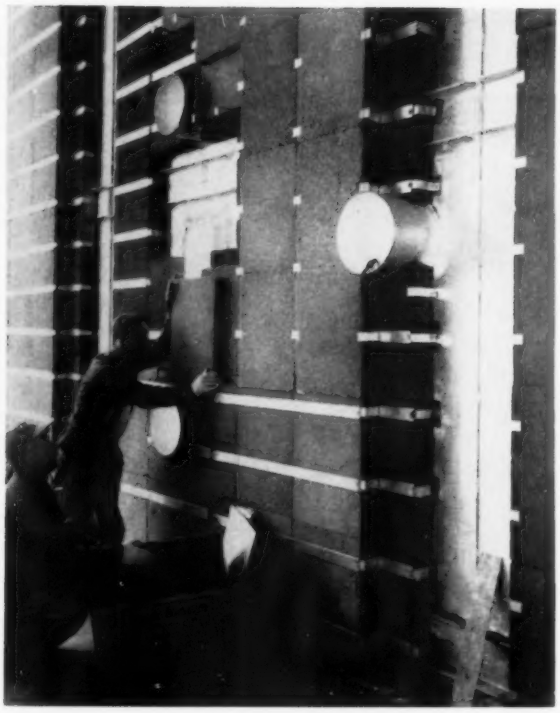
By Richard W. Scott, Manager, Great Lakes Division, Crouse-Hinds Company, Detroit, Michigan

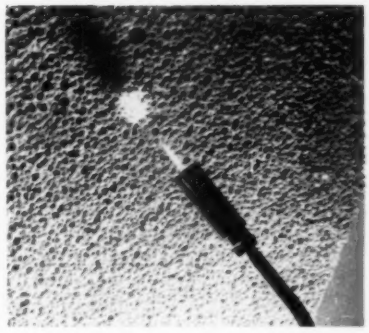
FACTORY MUTUAL reports for 1956 covers a study of 2121 explosions made over a 12 year period. The total loss was over $25,000,000 and was about equally divided between direct property damage and occupancy loss. This study did not include major disasters such as occurred at Texas City in 1947. It is interesting to note that gases and vapors were responsible for 12 per cent of the explosions.

In hazardous areas, a function very often overlooked is the design of a safe lighting system. Greater safety is afforded if these lighting systems are given the same careful consideration that are given power networks.

Conventional explosion-proof lighting fixtures and portable lamps are now available for Class I, Groups A, B, C, and D, as well as Class II, Groups E, F, and G. Complete lighting systems can be designed for all types of hazardous industrial locations as well as garages, service stations, finishing processes, hospital operating rooms, metal finishing, coal handling, and grain elevators. These, of course, cover only a few of the specific Class I and Class II hazardous areas.

One must realize the importance of using explosion-proof and dust-ignition proof equipment in hazardous areas. We stress the importance of the Underwriters Laboratories inspection service which makes sure that approved equipment is properly installed, thereby reducing fire losses and accident hazards. Summing up, there is no need to "compromise with safety" when proper lighting equipment is available for hazardous areas. **End**





Left: Insulation material is being installed in aeronautical test chamber for high and low temperature development work. Above: It can be easily cut and shaped. Right: When subjected to flame and water-quenched, the insulation does not crack or spall

New High-Low Temperature Insulation

It Is Acid-Proof, Non-Porous, Easy to Cut and Shape

TEMPERATURE PROTECTION from as low as −450 F to as high as 2200 F is available to industry in the form of a new insulating and refractory material.

The new insulating material, called Foamsil, is 99 per cent pure fused silica and can neither oxidize nor absorb moisture. It is unaffected by all acids with the exception of hydrofluoric and hot phosphoric. It does not warp, shrink or slump during rapid temperature changes. When subjected to intense heat (such as that of steel-cutting oxyacetylene torch) and then water-quenched, it does not crack or spall.

It has a low expansion coefficient of 3.5 x 10^{-7}, about 1/18th that of low carbon steel, which gives the material volume stability throughout its entire temperature operating range. For operating temperatures up to 2200 F, the insulating material actually expands whereas most insulations shrink.

It has been heated in a furnace at 1600 F for more than two years without any evidence of deterioration. This feature reduces the need for expansion joints and vertical clearances, and virtually eliminates joint separations due to expansion and contraction.

Light in weight (10 to 12 lb per cu ft) and having a compressive strength of 130 to 210 psi, this new material can be used as a load-bearing surface to eliminate some of the supporting and reinforcing structure required with conventional material.

The material has a wide range of applications in the chemical and chemical process industries as well as many areas of the metallurgical, electrical, electronic, nuclear energy, petroleum, petrochemical and aeronautical fields.

Laboratory and industrial applications show it to be ideal as a lining inside tanks and pipelines that contain hot acids of any concentrations. The sealed silica cells prevent absorption of the acids, inflammable solvents of vapors, thus assuring full original insulating value throughout the life of the equipment it serves. Because of the absence of capillary action, the material also cannot act as a wick for transfer of inflammable liquid or gas to critical areas.

Concrete, brick or steel stacks subjected to corrosive atmospheres may be readily lined with this material. It can be used as underground thermal and electrical insulation or in the high temperature electrical insulation field. **End**

Additional Information

If you would like more information about this insulating material, address your inquiry to the Editor, Plant Engineering, 308 E. James St., Barrington, Illinois, or indicate "Foamsil" on the post card in this issue.

This Building Is Made of Arches

It's Pre-Engineered
It's Galvanized
It's Easy To Erect

Fig. 1. Arch ends are set in trench in the floor slab at each side of the building. Weight of the sheets holds them in place

SHELTER IN A HURRY, with a pre-engineered trussless steel building—that's what the Rice and Powell Grain Co., Chicago, got when a grain bag loading plant was erected in less than a week's time after the concrete slab was poured.

Arch panel in design, with a 63-ft unsupported roof span, the 82-ft-long building is fabricated entirely of 18-gage JalZinc, zinc-coated steel produced by Jones & Laughlin Steel Corp.

Each steel arch, which combines sides and roof of the building in one long arc, has its ends anchored in trenches at each side of the concrete slab. At the center of the arch, the sheeting is about 25 ft above floor level.

The entire trussless structure was fabricated at the plant of its producer, the Wonder Building Corporation of America, and no erection equipment was required except portable scaffolds and holding jigs.

Individual panels were bolted together in jigs at the job site, to prefabricate arch sections. These sections were raised into position by workmen who lifted each completed section readily, using rope slings.

Roof sheets in the building have a nominal width of two feet and a depth from crown to valley of 7⅞ in. Length of a standard sheet is about 10 ft, with holes for 5/16-in. bolts on 12½-in. centers along each rib. Six holes across each end of the ribs provide a means of bolting the end joints. Neoprene washers were used to seal the bolts against the panels. **End**

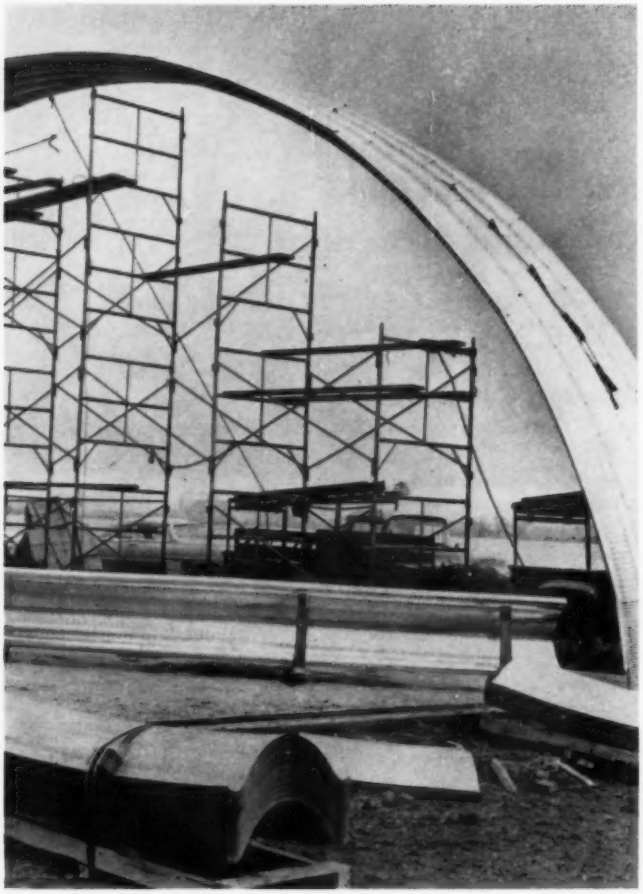
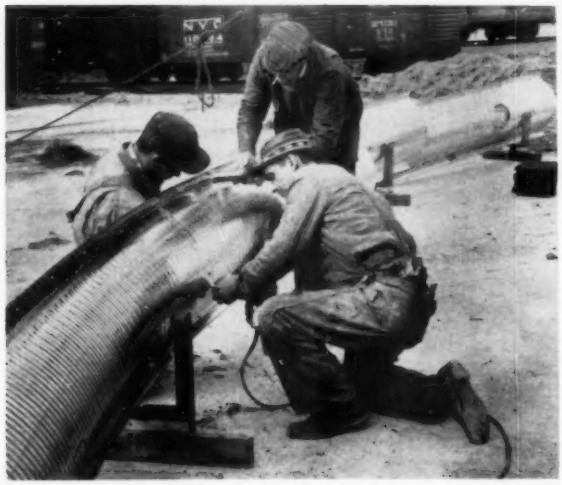
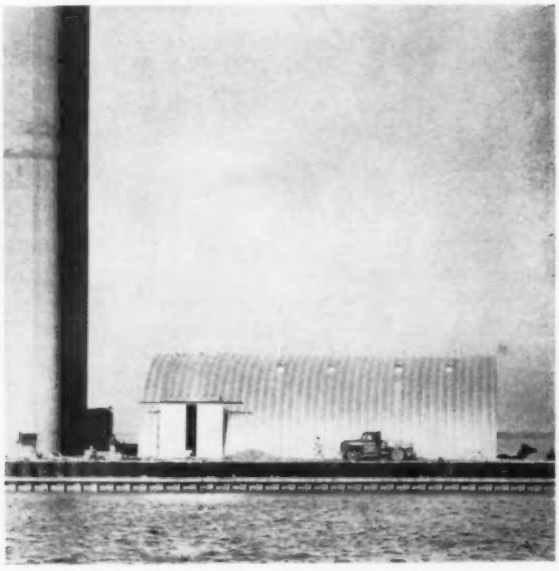


Fig. 2, at right. Workmen raise assembled arch sections into place, using rope. Light weight of sections minimizes effort

Fig. 3, below, right. Almost dwarfed by the grain elevator, completed trussless building stands on shiploading pier

Fig. 4, below. Using power wrenches, workmen assemble panel sections into arch. Job is done in simple jigs, on slab





Packaged Boiler Specifications

What To Look for in an Integrated Steam Generator

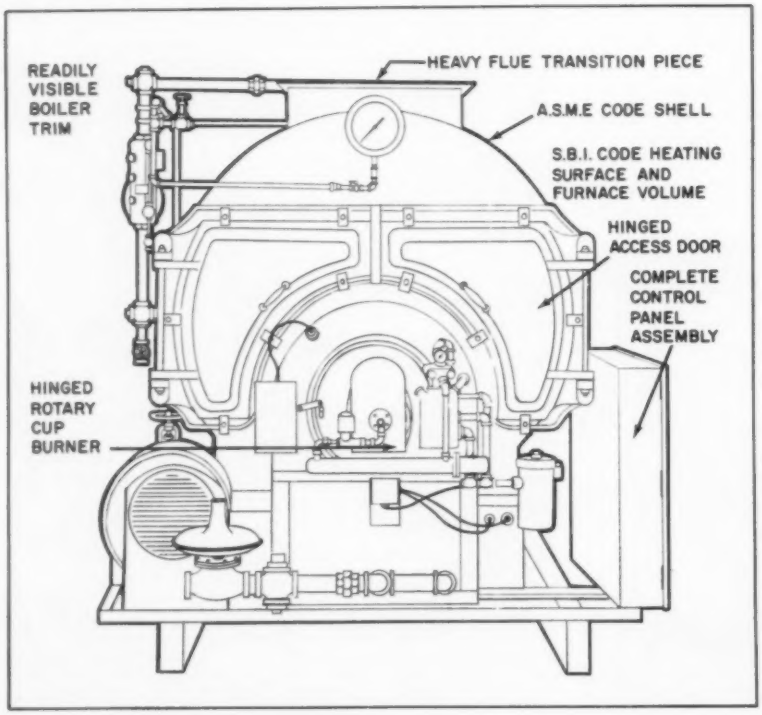
By DENARD L. GUSLER, Clark, Buhr & Nexsen, Architects and Engineers, Norfolk, Virginia

FEW YEARS AGO when a company purchased a boiler it was necessary to purchase separately a burner, combustion control system, oil preheating equipment if required, flame failure protective system, and other related equipment, with each specialty furnished by a different manufacturer. Then quite suddenly the idea of combining the boiler and all specialty items into an integrated unit under the responsibility of a single manufacturer was conceived and the result was the packaged steam generator.

The integrated boiler unit was immediately accepted by industry with the result that most of the old manufacturers of boilers and many new companies were soon manufacturing a packaged unit. The result has been a highly competitive market with different designs of both boiler and related mechanical arrangements. It has thus become increasingly difficult to properly specify a packaged steam generator for competitive bidding and still be assured that the owner will obtain a quality product.

It is of course possible to specify a boiler by name and adding the suffix "or equal." This is seldom satisfactory since there can be much discussion about the exact meaning of "or equal." A solution to the problem is to use the accepted standards of industry in writing the specification and to briefly base other requirements on performance and function leaving the exact method in the hands of the manufacturer.

Fig. 1. Burner assembly in illustration is grouped for service, maintenance


READILY VISIBLE BOILER TRIM
HEAVY FLUE TRANSITION PIECE
A.S.M.E CODE SHELL
S.B.I. CODE HEATING SURFACE AND FURNACE VOLUME
HINGED ACCESS DOOR
COMPLETE CONTROL PANEL ASSEMBLY
HINGED ROTARY CUP BURNER

Unfortunately the accepted standards of industry with reference to packaged steam generators seem to be capable of varied interpretation with the result that packaged steam generators of a given horsepower rating may differ.

Each of the boilers of Table I is constructed in accordance with the American Society of Mechanical Engineers' Boiler and Pressure Vessel Construction Code. On page c of the code it states: The Boiler Code Committee does not approve, recommend, or endorse proprietary or specific designs, nor does it assume to limit in any way the builders' right to choose any method of design or form of construction that conforms to the Code rules."

The difference in physical dimensions and resultant weight of metal used is that Manufacturer No. 2 used the Steel Boiler Institute Rating Code. The Steel Boiler Institute was founded in 1929 by a representative group of steel boiler manufacturers. One of the first accomplishments was the SBI Rating Code.

I do not presume that the SBI Rating Code is necessarily the code that should be adopted by all manufacturers of steel boilers. But in the absence of other criteria it is a standard code as indicated later in the article.

In order that the guaranteed performance of a proposed installation may be established it is necessary to specify the fuel that will be burned in the boiler furnace. The exact analyses may be obtained from the oil company that will supply the fuel oil.

Fuel analyses for natural gas will

vary according to the origin of the sample and can be readily obtained from the company supplying the locality in which the packaged steam generator is to be installed.

Desirable features that should be included in a properly specified packaged steam generator are shown in Figs. 1 and 2. In Fig. 1 note that the combustion control panel with related appurtenances is located to one side of the front of the boiler so that routine maintenance can be performed without endangering delicate electrical parts.

Hinged Burner

The burner assembly is easily accessible for service and maintenance with each component easily removable for replacement or repair. The hinged doors swing open for access to the boiler flues without interference from the burner assembly. The burner is hinged and will swing open to permit cleaning. The furnace volume is large and the heating surface is adequate to insure a long boiler life without metal fatigue.

The specifications that follow are written to obtain a "quality" product. They are arranged so that three or more manufacturers can bid competitively to obtain the best possible current market value and at the same time exclude a product that does not conform to SBI code standards or one that does not contain the features that this writer considers desirable in a packaged steam generator. It is necessary that these specifications be used only as a guide. A relatively short article such as this cannot possibly cover all materials and arrangements that might necessarily be a part of a given specification.

The packaged steam generator shall be a multi-pass, horizontal, fire tube boiler complete with burner, fuel pump, forced draft fan, controls, boiler trim, and appurtenances all as required to comprise a completely self-contained unit. Connections required to place the unit in operation shall include steam, water, fuel and electricity.

Boiler shall be rated in accordance with the Steel Boiler Institute Code for mechanically fired boilers. The operating and design pressures shall be as specified. The capacity

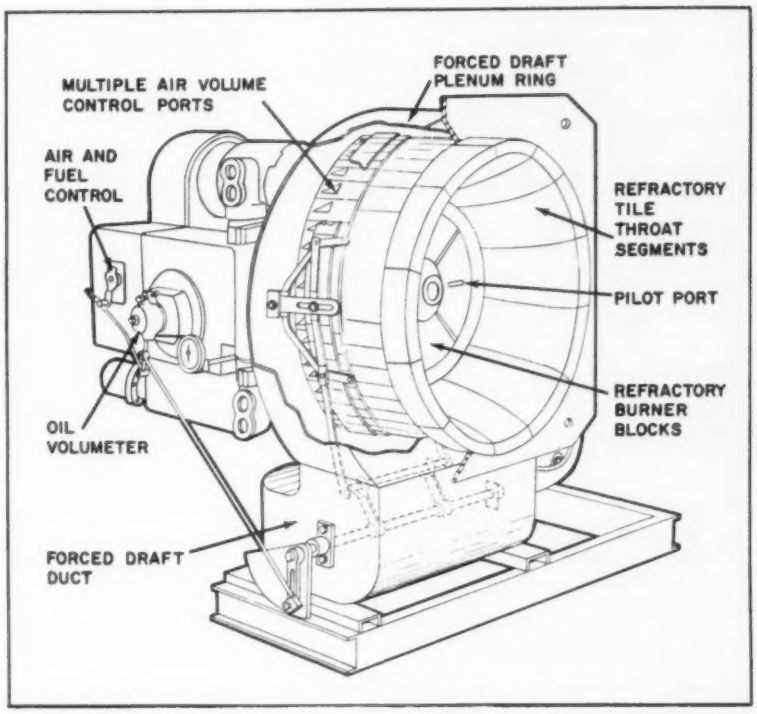


Fig. 2. Design provides for adjustable peripheral ports for forced draft air

shall be in Btu's per hour based on the evaporation rate in pounds per hour from and at 212 F. Combustion efficiency shall be 83 per cent when fired with oil as specified and 80 per cent when fired with gas as specified when the boiler is operated at the SBI rating.

Boiler shall be constructed of steel and shall be in accordance with the current Construction Code for Boilers as published by the American Society of Mechanical Engineers. Doors providing access to fire tubes for cleaning purposes shall be hinged and mounted so they can be opened without interference from any boiler appurtenances or trim. Doors shall be gas tight and held in place with quick opening locking lugs.

All component parts of the boiler shall be conveniently located and arranged so as to be readily available for routine operation and maintenance. Instruments or gages shall be located as to be easily visible to the operator. Piping shall be provided with unions as required for dismounting specialty equipment. The boiler heating surface and resultant Btu per square foot shall be as computed from the SBI Rating Code.

The boiler shell shall be constructed of heavy flange quality steel with heads and furnace of firebox quality. Welds shall be in accordance with the A.S.M.E. Code and stress relieved as required. The shell shall be equipped with a steam nozzle, safety valve nozzle, feed noz-

Table I. For the same horsepower the figures of the two boiler firms disagree

	Manufacturer No. 1	Manufacturer No. 2
Boiler Horsepower	60	60
Steam per Hour	2070	2100
Furnace Volume (Cu Ft)	9.1	62.4
Heating Surface (Sq Ft)	252	500
Length of Shell (In.)	128	151
Diameter of Shell (In.)	42	60
Burner Type	Pres. Atomizing	Rotary Cup
Weight (15 psig)	6833	10,150
(125 psig)	8160	14,500

zle, manhole with cover and yoke and all other connections as required for boiler trim and appurtenances.

Fire tubes shall be of seamless steel rolled and beaded into the tube sheets so that the tubes will be water and vapor tight. The tube arrangement shall be so as to provide a maximum rate of heat transfer with a minimum of interference with the natural circulation of water. The tube openings shall be easily accessible for cleaning purposes and removable from the front or rear of the boiler.

The furnace shall be of cylindrical construction with straight or corrugated sides welded to the tube sheets and arranged so that no undue stress will result from the furnace heat. The furnace volume and resultant heat release shall be as computed from the SBI Rating Code.

Flame from the burner shall not impinge on the sides of the furnace. No harmful erosion shall result from the travel of the combustion gases. No hot spots shall result that will cause deterioration or weakening of the furnace metal. The location of the furnace in the shell shall be so that it will not interfere with the natural circulation of water in the boiler.

Burner combustion ring, rear combustion chamber, and target wall shall be lined with a refractory suitable for the service that is capable of withstanding the maximum temperatures produced under maximum load conditions without cracking or spalling. Refractory shall be furnished and shipped in place with the boiler unit. Refractory damaged in transit shall be replaced.

Observation Ports

Observation ports shall be provided for visual check of combustion conditions. The flue transition piece shall be capable of supporting the total weight of the boiler vent to which it is connected.

All exterior surfaces of the boiler except doors, handholes, manhole, and observation ports shall be insulated. Insulation shall provide a maximum surface temperature of 140 F in an ambient temperature of 100 F at the maximum load imposed on the boiler. The insulation shall be suitably cased in an all-metal jacket of not less than 20 gage thickness. Suitable retaining rings shall be provided at edges of insulation to prevent chipping or damage to insulation.

Boiler shell and appurtenances shall be supported on heavy steel members and a channel frame steel base constructed and welded to the boiler shell. The integrated unit shall be suitable for installation on a flat concrete surface or vibration absorption pads capable of supporting the operating boiler load.

Boiler trim shall include a water column complete with test cock, three try-cocks, and blow-down valve; feed water regulator with three valve by-pass; low water cut-out; feed stop and check valve; safety valves; and all fittings, piping, and appurtenances as required. Boiler trim and installation shall comply with the requirements of the boiler construction code. A steam pressure gage and shut-off cock shall be mounted on the front of the boiler so as to be readily visible.

The blow-down valve assembly shall include a quick-opening valve and a slow-opening valve. For boilers above 15 psig operating pressure a steam injector shall be provided and piped for emergency water make-up. A flue gas thermometer shall be provided so as to be readily visible from the boiler room floor and shall be suitably graduated for the temperatures encountered in the last pass of the boiler at the flue transition piece. Boiler trim shall also comply with the requirements of the insurance company having jurisdiction. Boiler trim shall be furnished and piped as a part of the packaged steam generator unit.

Oil burner shall be pressure atomizing or rotary cup type suitable for the fuel as specified.

NOTE: A pressure atomizing type burner shall be used only for No. 2 grade oil and up to a steam generating capacity of 2500 lb per hr. For all other grades of oil and boiler capacities a rotary cup burner shall be used.

Unit shall include burner, forced draft air supply system, and control system completely integrated to comprise a boiler firing system to operate in conjunction with the boiler as specified.

The burner unit shall be mounted on the front of the boiler and supported by the boiler base. It shall be complete with fittings, piping, and accessories as required for maximum safety and efficiency of operation. Burner unit shall meet the requirements of the National Board of Fire Underwriters.

Fuel pump shall be electrically driven, positive displacement type capable of pumping the oil specified with the suction life indicated against pressure required by the burner at maximum rated load.

Solenoid valves shall be of the positive closing type and suitable for the service intended.

Strainers shall be duplex type with by-pass and located so as to insure a positive supply of clean oil to the burner and appurtenances.

Relief valves shall be provided and located as required to relieve

Minimum Firing System Accessories

1. Complete burner assembly
2. Oil circulating pump
3. Magnetic oil valve and snap switch
4. Gas-electric ignition assembly (Electric assembly for No. 2 oil only)
5. Strainer assembly
6. Check and relief valves
7. Motor and linkage for modulating air-oil control with auxiliary switch (intermittent on-off for pressure atomizing burner)
8. Pressure and vacuum gages
9. Air flow safety switch
10. Electronic flame failure protection
11. Oil heater assembly complete with fittings, piping, and appurtenances (as required for heavy fuel oil)
12. Oil thermometer (heated fuel oil)
13. Oil meter to measure flow of fuel oil
14. Totally enclosed control panel

dangerous pressure on oil pump or accessories and shall be piped to return oil to the fuel oil tank.

Fuel oil heaters for heavy fuel oil shall include one electric type and one steam or below-the-line hot water type. Electric type shall be thermostatically controlled and shall heat the oil to ignition temperature at low boiler load until such time that the steam or hot-water heater can carry the heating load. At that time the electric heater shall cut off. The steam oil heater shall be a shell and tube type with removable head and heater assembly. It shall be thermostatically controlled to maintain the fuel oil at ignition temperature at the maximum rated load on the boiler. The fuel oil control bypass shall provide for recirculation of the fuel oil through the preheater during "on-off" cycling periods.

Heater and Circulating Pump

Where steam or hot water is not available for heating the heavy fuel oil during a period of boiler shutdown, there shall be installed a separate electric oil heater and oil circulating pump. These shall operate during the shut-down period in order to maintain the oil in a sufficiently fluid state for starting purposes.

This circulating pump shall have a maximum capacity as required. An electric oil heater of suitable capacity shall be thermostatically controlled to maintain the oil in the suction and return lines at a minimum of 100 F.

Primary forced draft air supply fan shall be a statically and dynamically balanced unit integrally constructed with the burner for primary air supply.

Gas burner shall be ring type with multi-jets suitable for burning natural, mixed, or manufactured gas as specified. Installation of the burner shall be essentially as described for the boiler oil burner with all parts readily accessible for cleaning or repair. Burner shall meet the requirements of the National Board of Fire Underwriters. The burner shall be installed so that an oil burner as specified previously may be installed at a future date. All controls for gas shall be designed to operate with the controls required for oil firing. Minimum gas burner accessories shall include the following: main lubricated shut-off valve; pressure and regulating flow control valve; gas pressure gage; automatic quick-acting and tight shut-off valves; and all appurtenances required for automatic firing of gas.

Combination burner shall include all fittings, piping, and appurtenances as described in the foregoing sections on the oil burner and the gas burner. The changeover from oil to gas shall be accomplished by operation of a single switch.

Control assembly shall be a completely integrated unit installed in a control panel located on the boiler unit so as to be readily accessible and visible without interference with routine boiler maintenance. The control assembly shall include all devices necessary for automatic control of steam pressure, combustion, boiler water level, ignition, starting sequence, programming and as necessary for fully automatic operation.

The following shall be the minimum control equipment included: draft control; draft gage; modulating pressure control (intermittent for pressure atomizing burner); pressure limit regulator; motor starters for all motors; voltmeter; signal lights; changeover switch (oil to gas); and electronic combustion control equipment to function with the electronic flame failure protection listed with burner accessories.

Control equipment shall protect against flame failure, extreme low water, excessive steam pressure and shall require manual reset. Motor starters shall include thermal overload protection. Equipment shall be suitably interlocked with safety and control devices coordinated to act together automatically without hunting or surges. All electrical wiring, safety devices, and automatic controls shall conform to the National Electrical Code and shall bear the Underwriters' Laboratories seal of approval.

For units rated up to 2500 lb per hr, when burner is fired with domestic No. 2 oil, the ignition may be of the intermittent electric type. Above this rating and with all other fuels the ignition shall be gas-electric. Gas pilot shall be installed integrally with the main burner so as to burn directly in the path of the main burner flame.

Steam Pressure Control

Steam pressure shall be controlled by a pressure regulator connected to the steam space of the boiler. The control shall function to control the burner and draft fan controls through an electrical relay system so as to maintain the steam pressure within the prescribed limits at all burner loads within the rated capacity of the boiler.

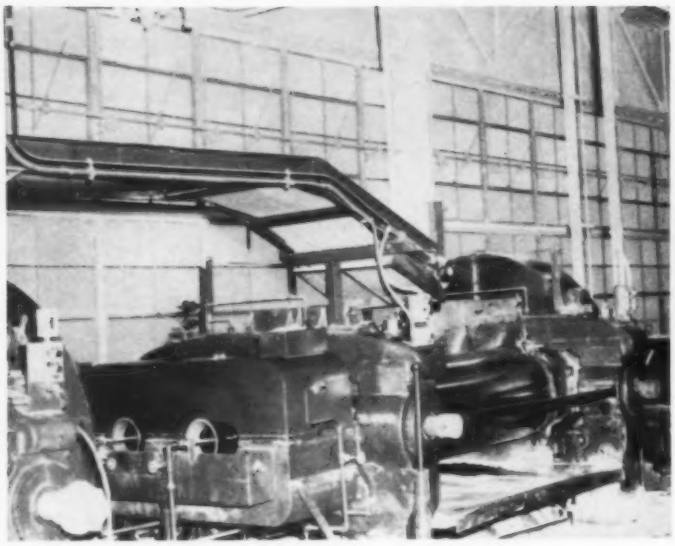
The controls shall have an adjustable pressure, a differential adjustment. They shall include a separate pressure limiting element to insure that the safe operating pressure of the boiler is not exceeded.

Flame failure and programming control shall be of the electronic type suitable for the fuel being burned and shall function to insure a safe start and programming of the main burner equipment. The controls shall shut down the boiler in the event of a flame failure and shall

(Continued on page 198)

Some of the Items To Specify in Packaged Unit

1. Fire tubes
2. Furnace
3. Water level regulator and low-water cut-off
4. Refractories
5. Boiler trim
6. Shell
7. Fuel oil heaters
8. Combination burner (oil and gas)
9. Control equipment
10. Ignition equipment
11. Primary air supply fan
12. Pressure control
13. Draft fan control
14. Fuel oil pump



Left: The use of tinted plastic glazing prevents further increase in building temperature from solar radiation. Above: Glazing in expansion wall lets in maximum light but also simplifies removal of the wall when building is enlarged

Lets In Light, Shuts Out Sun's Heat—

That's How Tinted Plastic Glazing Is Helping This Plant

LAST SUMMER'S experience at the Noblesville, Ind., plant of Firestone Industrial Products Co., a division of Firestone Tire & Rubber Co., demonstrated that plastic glazing, based on an acrylic-modified polyester resin, made a noticeable difference in the interior temperature despite constant operation of dozens of curing presses and other steam-heated equipment.

During the daylight hours the plant is illuminated principally by natural light through bands of tinted plastic glazing around the four sidewalls. The interior is bright, but free of annoying dazzle and glare.

The one-story building — which measures 660 ft long, 128 ft wide and 25 ft high—is glazed with nearly 5000 green-tinted 24 in. by 16 in. panes of 0.080 in. Structoglas A plastic panes. The full length of the plant's north wall is glazed with a 12-ft band of windows extending along the top of the 3 ft 9 in. concrete foundation wall. The south and east walls both have continuous bands of glazing 9½ ft high, while the west wall contains abbreviated stretches of the glazing, owing to the number of truck entrances and doorways on this side.

One of the reasons for the more extensive use of the glazing in the north wall is that it is intended as an expansion wall. The large amount of lightweight glazing will facilitate removing the old wall quickly, and with a minimum of cost and wasted material because the glazing panels can be re-used.

Interior 15 Degrees Cooler

According to J. S. Robertson, staff engineer at Firestone, during July and August the interior of the new plant averaged about 15 degrees cooler than the older building where the same types of steam-heated process equipment are used. He attributes some of this difference to better ventilation and the higher ceiling, but much of the reduction is due to the high proportion of ultra-violet and infra-red radiation screened out by the glazing.

Although reinforced polyester panels have been used for nearly 10 years for various construction purposes, such as shelters, partitions and sidewalls, the weather resistance properties have not been all that could be desired.

The problem of improving the outdoor properties of polyesters has been met by the development of an acrylic-modified polyester resin, Paraplex P-444, by the Rohm & Haas Co. of Philadelphia. As a result of the acrylic modification, the "hybrid" plastic reflects many of the advantageous properties of acrylic plastics, especially weather resistance, light stability, optical qualities and mechanical strength.

Besides reducing heat and glare, plastic glazing pays its way by eliminating chronic breakage problems. In the adjacent Firestone plant equipped with conventional glass glazing, the breakage averages close to 12 panes a week. Breakage occurs through carelessness in handling tools, poles and occasional vandalism. In summer, the frequent adjustment of monitor windows is responsible for substantial breakage because of the high twisting forces on the glass as the frame is cranked open and closed. **End**

Oil Seals Are Important...

Select and Install Them With Care

By C. RICHARD McCRAY, Product Engineer, Garlock Packing Co.

OIL SEALS, to be efficient, must be properly designed. Just as important, the material of which the seals is constructed should be carefully selected to fit the application.

Initially, homogeneous oil seals were produced from specially compounded natural rubber. Although this was an important achievement at the time, synthetic rubbers which are much superior have become available. The first of these was neoprene, which offered better flexibility with good oil resistance. Neoprene is still widely used for many purposes, but for oil seal elements in general service, it has been displaced by nitrile rubbers. The nitrile rubbers, also referred to as buna-n, have very good resistance to non-aromatic oils and to elevated temperatures. They can be used in continuous service at temperatures as high as 250 F and intermittently up to 275 F. For unusual service conditions, such as exceptionally high or low temperatures, high speeds, or contact with certain fluids harmful to conventional synthetic rubber oil seals, a suitable synthetic can be selected from a variety of special materials such as silicone, polyacrylate, or duPont Teflon.

The design of the seal and the material used in its construction are not the only factors affecting efficient operation. The design of the equipment, and the specification of materials used in the equipment, are also important. The shaft must be of proper dimension, finish and hardness.

On shafts up to 3 in. in diameter, a tolerance of plus or minus 0.003 in. is adequate for the surface contacting the lip of an oil seal, with greater tolerances acceptable on larger shafts. On high speed shafts, however, a closer tolerance is recommended — even on small diameters. For example, at speeds above 2000 rpm, the tolerance should be held to plus or minus 0.001 in.

The surface on which the sealing lip operates should be ground to a finish no rougher than 20 micro-inch. On high speed shaft applications, surfaces as fine as 4 to 5 micro-inch give better service. It has not been verified that super-finishes finer than 4 micro-inch offer any improvement in sealing effectiveness; however, it has been found that oil seals are more efficient on a 4 micro-inch shaft than on a 16 micro-inch when operated under the same conditions.

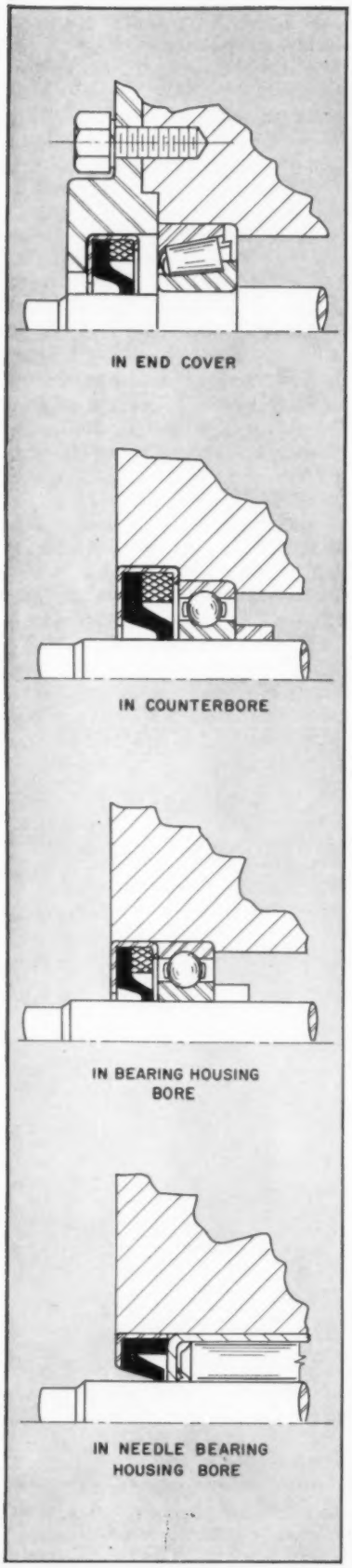


Fig. 1. Methods of applying unit seals

Shaft Hardness Is Important

To obtain acceptable shaft life in oil seal service, the shaft supporting the lip of the oil seal should be at least 30 Rockwell C. On a softer shaft surface, the synthetic rubber sealing element of the oil seal will score the shaft, eventually damaging the oil seal and resulting in leakage. This requirement for a shaft of suitable hardness rules out the use of untreated steel bar stock or brass or bronze shafts, or even of untreated stainless shafts if long service life is to be achieved. However, a mild steel shaft will give excellent results if the seal contact area is plated with a non-porous chrome plating not subject to cracking or peeling.

Another group of inter-related factors affecting seal performance are shaft eccentricity, run-out and speed. As expected, an oil seal on a shaft operating at high speed can accommodate less combined eccentricity and run-out than the same shaft and seal running at a low speed. For example, at 100 rpm a seal could operate effectively with

eccentricity and run-out totalling 0.020 in., while at 4000 rpm, the figure would be reduced to 0.002 in.

Machine design can provide for installation of oil seals in different ways. The most complex (but occasionally the most desirable) method is to install the seal in a separate end cover which is bolted to the unit. It is usually a simpler procedure to press-fit the oil seal into a counterbore provided in the frame of the machine; on some machines, it is feasible to fit the oil seal into the same bore as the bearing.

The lip-type radial contact seal is not intended for service under pressure. On small-diameter (up to ½ in.) shafts and speeds under 100 rpm, certain designs can be used at pressures up to 35 lb per sq in. but as shaft diameter, speed, or both, increase, the pressure must be reduced. For general consideration, the pressure differential across a seal should be limited to 2 or 3 lb per sq in.

Venting gear cavities to the atmosphere does not guarantee that the seals will operate at atmospheric pressure. Either a plain or antifriction bearing submerged in oil can build considerable pressure in a cavity between the bearing and an oil seal. Venting such a cavity around the bearing to the main cavity or to the atmosphere will relieve the pressure, enabling the oil seal to function as intended.

Don't Assume—Measure

The actual assembly of an oil seal into a machine is a simple procedure, but one which requires reasonable care and attention to details. The initial step should be a check of dimensions of the machine parts which mate with the seal lip and O.D. It is essential to actually measure the parts. While the fit of the oil seal on the shaft and in the housing bore is of paramount importance, the width of the seal is not critical. Press-fitting the oil seal against a counterbore shoulder assists in maintaining proper alignment but the same objective can be accomplished in a properly machined housing by press-fitting the seal until its back surface is flush with the face of the housing.

Application of lubricant, either to the shaft or to the sealing lip, facilitates assembly, and assures presence of lubricant when the unit is placed in service; the seal might otherwise operate dry for a short period of time, resulting in a drastic reduction of service life. The surface of the shaft on which the oil seal lip operates must be smooth —free from burrs, nicks, or scratches. To simplify installation, the end of the shaft should be chamfered.

The simplest mounting tool is a cone which opens the lip of the oil seal to shaft diameter as it is slid into position. A similar mounting tool with a hollow center can be used in applying seals on shafts having a shoulder. By providing an extended

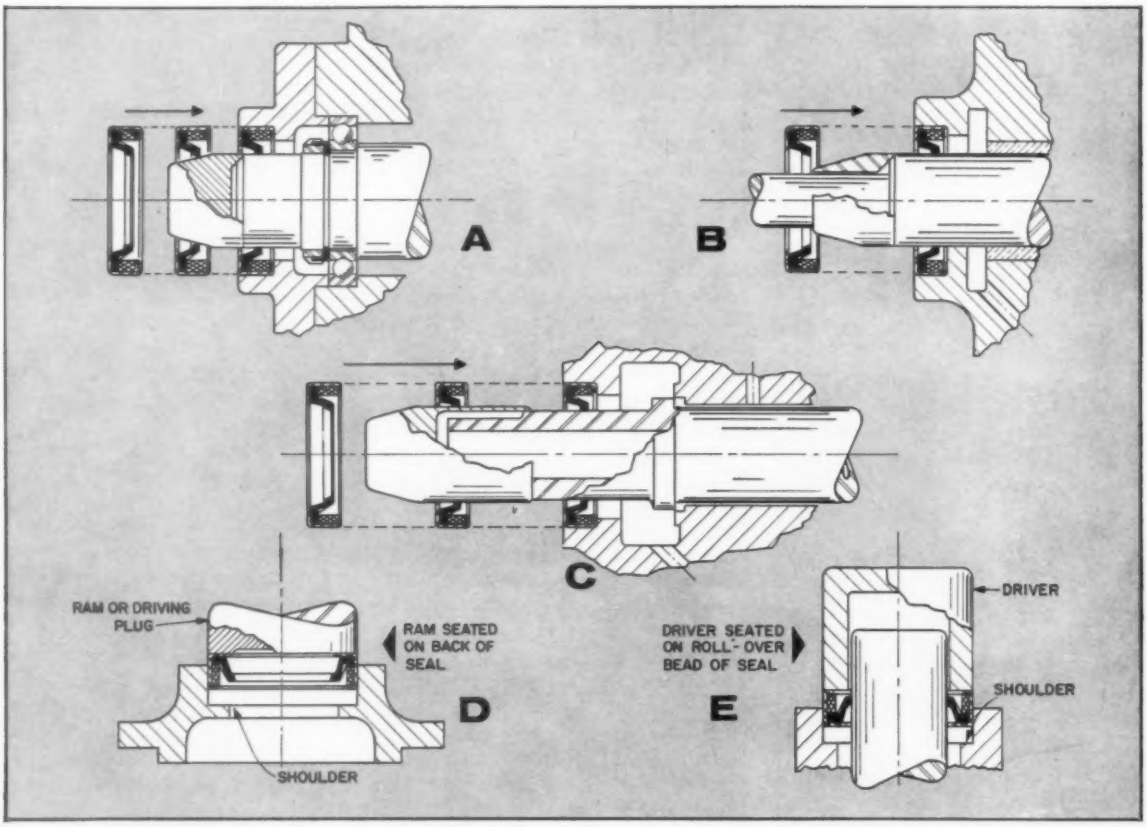


Fig. 2. Tools for installing unit or lip-type seals. Nose cones permit seal to slide over shaft ends smoothly. A, cone fits on end of shaft; B, hollow cone fits over end of shaft; C, extended cone protects seal from damage by keyway; D, mounting seal in cover, with no shaft; E, recessed ram used when shaft is in place. Shoulders insure right angle mounting

lip on the mounting tool, the oil seal may be applied to shafts with splines or keyways without damage to the sealing element. See Fig. 2.

It is particularly important that all of these mounting tools be handled with care to prevent nicking or raising burrs on the edges which could cut seal lips. The extended lip tool for covering splines or keyways should have a wall thickness of not more than $\frac{1}{64}$ in.

The recess into which the seal is fitted should have a smooth, machined diameter with a chamfer. It is not necessary to use a sealing agent on the outside diameter of the oil seal, but if it is used, make certain that none is spilled on the shaft or on the oil seal lip.

On small pieces of equipment which can be readily moved, the oil seal can be easily mounted, using an arbor press. The ram for press fitting the seal should be located concentrically with the seal O.D. and should be not more than 0.010 in. smaller than the oil seal. This precaution assures that the press load is applied at the outer diameter of the shell or on the roll-over bead, depending on the direction of installation. If the shaft is already in position at the time the oil seal is press-fitted, the driving tool may be recessed to fit over the shaft.

In performing maintenance work, where mounting tools may not be available, the lip of the oil seal can be protected from damage by forming a mounting tool from shim stock. All sharp edges and burrs should be removed from the shim stock material before attempting to apply the oil seal. As emergency measures, the same purpose can be accomplished by using heavy kraft paper or by covering splines, keyways, or small shoulders with cellophane tape.

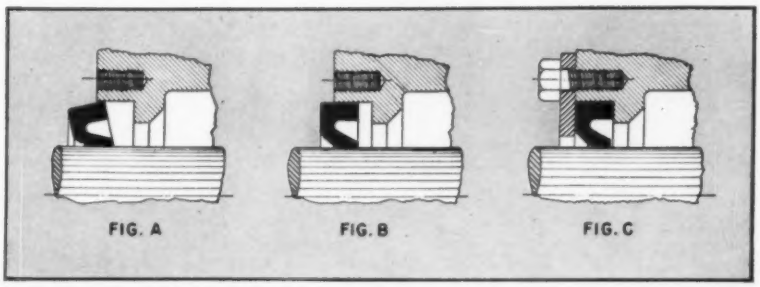


Fig. 4. Installation sequence shows the stages of inserting split seal into housing

Installing Split Seals

The installation of the split seal is simple. After making certain that the shaft and housing are clean and free of foreign matter, apply a lubricant to the shaft, wrap the split seal around the shaft and align the joint at the top of the housing. Start both sides of the joint into the recess as indicated in Fig. 4, working away from the joint in each direction until the entire circumference of the seal is started in the recess and aligned.

Again starting at the joint, the seal is worked into the recess until the forward edge rests against the shoulder. The back side of the seal should, at this point, project approximately 0.015 in. from the housing. The cover plate is then bolted into position—clamping the seal firmly in place.

Removal of oil seals is occasionally accomplished by dismantling the equipment and pressing the seal out with an arbor press, but more frequently by using a chisel or a screwdriver to pry the oil seal from its housing.

The simplest method for removal, however, is to use a commercial oil seal puller which consists of an expanding head to grip the I.D. of the metal shell and a sliding weight attached to the head by a bar.

Modern oil seals have been engineered and developed to provide the best possible service using available materials. Realization of the maximum benefits from these units is dependent on adequate knowledge on the part of the user as well as the manufacturer. **End**

Plastic Model Lets Researchers Watch Smoke Flow

IN A JOINT EFFORT with their steel mill customers, Research-Cottrell, Inc., is perfecting the study of gas flows, using plastic models. Of prime concern is the flow of stack gas through an electrostatic precipitator.

Use of the clear plastic models permits visual observation of gas flow through ductwork leading into and out of the precipitator.

The effect of inserting perforated plates in the ducts is under study; some of the factors being appraised include the distance between the plates, distance of the plates from the precipitator and plate areas.

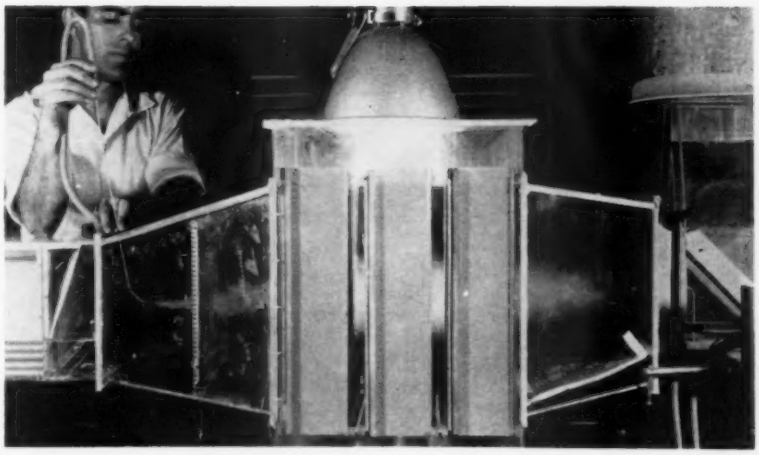


Fig. 1. A side-loading unit shown handling a crated 67-ft plane wing section

Courtesy Baker-Raulang Co.

Movers of Materials

Equipment Types for Yard Handling

By A. T. GAUDREAU, Gaud-Reau Associates, Westport, Conn.

Courtesy International Harvester Co.

Fig. 2. Above, a utility yard tractor equipped for different types of work

Fig. 3. Below, familiar type of truck holding crates designed for stacking

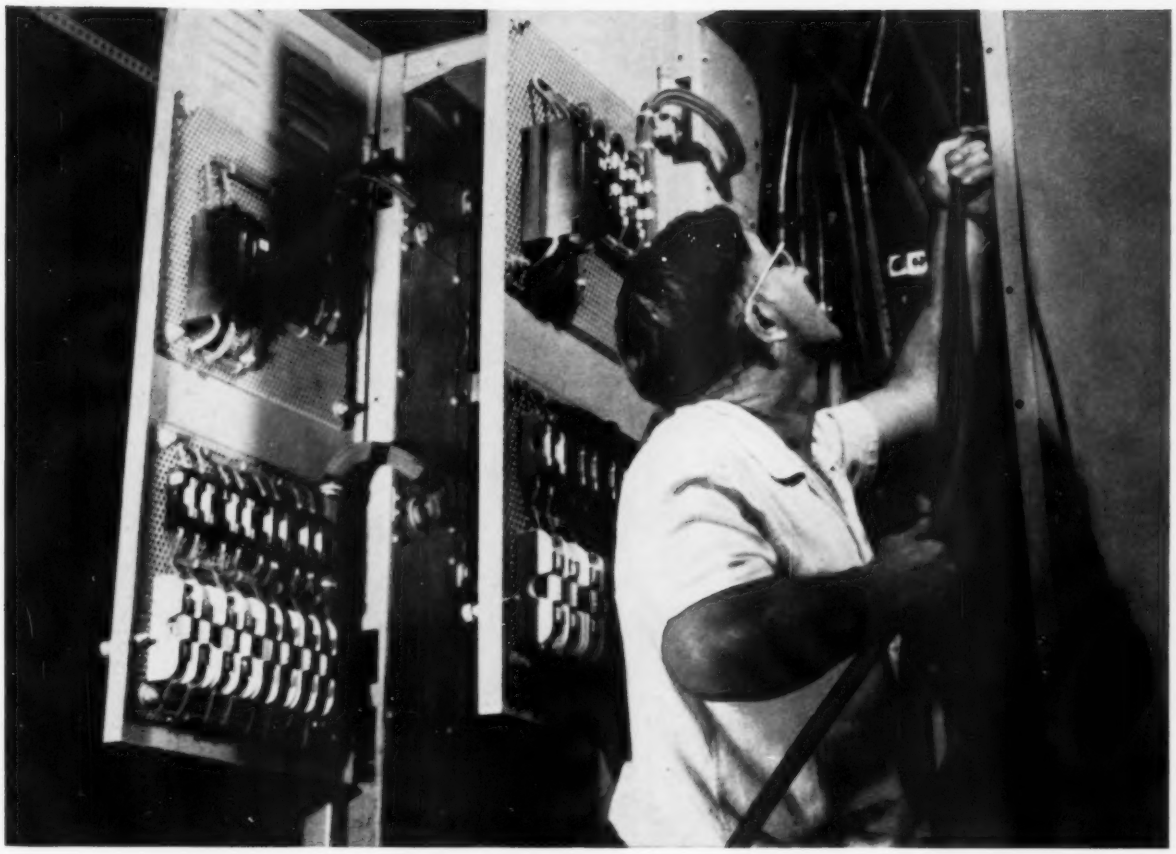
Courtesy Baker-Raulang Co.

INDUSTRY IS TURNING to outdoor storage yards to meet the necessity of increasing storage space without incurring the rising costs of constructing new plant buildings. The experience gained with the indoor handling of palletized loads has led to the introduction of more and more palletization in yard storage areas.

In most yards, the former concept of heaps of material scattered more or less haphazardly about the yard has fast given way in recent years to an orderly layout of checkered storage areas marked off by traffic aisles in the manner developed for indoor storage. Loose piles of brick, castings and forgings have been transformed into neat, vertical stacks of boxed or palletized loads tiered up to four loads high.

Instead of moving small items by wheelbarrows, or large and heavy items one at a time by overhead crane, material is more and more being moved in unit loads of one or more tons each. This handling is done by powered industrial trucks capable of moving in any direction, over long distances, at variable speeds, over inclined ground levels and rough grounds, and under all weather conditions. See Fig. 2.

The common procedure for the handling of incoming materials to be stored in the yard calls for palletizing the items, unless they are received already palletized, and removing them to storage by fork trucks. Certain types of heavy and bulky incoming materials intended for yard storage are taken directly to craneway storage areas, either by railcar or by highway trailer. Yard storage areas under the cranes are increased in capacity by palletizing the loads stored in them.



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*Alternate sheaths of Rolene (polyethylene) or Roseal (flame-resistant polyethylene) are also available.

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Among the regular handling operations taking place in outdoor storage are the following:

1. Unloading railcars and road trucks.
2. Assembling material objects and packaged material on pallets or in skid boxes to form unit loads for stacking by fork trucks.
3. Stacking unit loads or stockpiling single items. Long items like bar stock, pipes, tubes and channels, are sometimes stored in stacking racks.
4. Unstacking unit loads, or reclaiming items from stockpiles.
5. Filling orders for plant processing needs or outbound shipments.

Because of the versatility of mobile devices, a certain amount of overlapping of functions inevitably exists in all of them. The preceding classification is therefore intended to serve as a rough guide rather than to be taken as a definite listing of equipment by functions.

A number of enterprises handling extra heavy unit loads frequently favor fork trucks for loads up to about 9 tons because of the greater flexibility of directional movement offered by these powered units. For loads beyond this weight range, straddle-carrier trucks, mobile cranes, or overhead bridge-cranes are frequently used.

Where travel distances begin to exceed 400 or 500 ft per round trip, tractor-trailer trains and straddle-carrier trucks are often more economical than fork trucks for these handling operations. Material moved more than 250 ft one way generally requires some manual operation by the truck driver, material handler, or a crane operator at destination.

Although the sky may be considered the theoretical limit of vertical space available for the height of stacks in an outdoor yard, the condition of the ground surface, and the trueness of the ground level must be considered.

Experience in extensive yard operations handling a wide diversification of material in boxed and palletized unit loads commonly indicates a maximum of about 16 ft in height for safe and economical stacking. Higher stacking can often be readily achieved without sacrificing safety, but it usually encounters the point of diminishing economic returns over the 16 ft level.

Handling Equipment for Plant Yards

The powered mobile devices commonly used for the performance of these material handling operations in plant yards include the following:

Short Hauls	Train Hauls
Fork Trucks	Industrial Tractors
Utility Tractors	Yard Locomotives
Crane Trucks	Utility Tractors
Heavy and Bulky Loads	**Heavy and Long Hauls**
Rubber-tired Mobile Cranes	Side-loader Yard Trucks
Rubber-tired Mobile Cranes	Side-loader Yard Trucks

In yards where many individual metal pieces, such as castings and other components, range in weight from 4000 to 10,000 lb, the lighter items are handled by crane-trucks of 10,000-lb capacity. See Fig. 4. The heavier parts are handled by rubber-tired cranes of 15,000-lb capacity. Crane-trucks of only 6000-lb capacity are also used in yards for handling many of the stored items that are not packaged. These crane-trucks also handle bulky packaged goods, and are frequently used as complementary devices to fork trucks.

A point of concern to the yard men in crane-truck operations, however, is the hazard confronting the hookman required to mount stockpiles of unpalletized pieces in order to hook or unhook a crane load.

In recent years fork truck application has been expanded considerably through the introduction of new types of attachments which have tended to remove some of the emphasis previously placed on the use of crane-trucks. Furthermore, less manpower is generally required with fork trucks than with crane-trucks.

To control properly the movement and utilization made of mobile equipment in a yard fleet which may include a dozen or more such powered units, it is often found desirable to install a two-way radio system on a number of the key vehicles. A central dispatch system operated through this communication medium can assist materially in avoiding wasted trips, and in reducing unnecessary back-tracking movements traveling empty over long distances.

When travel distances in a plant yard become too great to be covered economically by fork truck operations, consideration must then be given to the use of an industrial tractor-trailer system. Basic functions of these two types of handling systems differ considerably, however. The fork-lift truck, as its name implies, is primarily a powered elevator. The tractor-trailer train, on the other hand, operates almost exclusively for haulage.

In combination, however, they offer a system that is efficient and

Fig. 4. Time and money can be saved by utilizing a truck as carrier, tractor

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EQUIPMENT CHARACTERISTICS	FORK TRUCK (GAS-POWERED)	TRACTOR TRAIN	MOBILE YARD CRANE (RUBBER-TIRED)	STRADDLE CARRIER	SIDE-LOADING TRUCK
1. Length of load	9-10 ft crosswise of forks	Unlimited on straight path without turns	Unlimited when swing is controlled	Unlimited on straight path without turns	Unlimited, lengthwise of truck
2. Load capacity	Up to 15,000 lb	Up to 30,000 lb per trailer	12,000 to 150,000 lb	10,000 to 45,000 lb	3,000 to 12,000 lb
3. Lifting height	Up to 12 ft	None	Up to 200 ft	None	Up to 12 ft
4. Speed of travel	7 to 12 mph	3 to 4 mph	1 to 45 mph	25 to 40 mph	Up to 30 mph
5. Economical distance per trip (one-way)	Up to 250 ft	250 to 2,000 ft	Up to 500 ft	Up to 15 mi	Up to 1 mi
6. Aisle width	10 to 14 ft	12 to 15 ft for loading 15 to 18 ft at corners	20 to 30 ft	15 to 20 ft	10 to 12 ft for loading, 35 ft at corners
7. Stacking successive loads	Yes	No	Yes	No	Yes
8. Auxiliary services needed	None	Fork Truck to load and unload trailers	Rigger to hook and unhook each load	None	None
9. Height and width of load handled	Palletized load	Unlimited	Unlimited	Must fit rectangular opening under carrier	Height unlimited. Load extension beyond body of truck, 64 in.

Fig. 5. Comparison of the characteristics of various types of materials handling equipment suitable for yard work

economical. While fork trucks may be used as tractors, Fig. 4, they are most efficient in this haulage combination when used for loading pallets on and off the trailers. As a matter of economy, fork trucks should not travel more than 250 ft to deliver a load. When distance is a factor, it is usually more economical to team up the tractor-trailer system with fork truck operations.

The fork truck picks the unit loads out of storage, carries them to the trailer train and deposits them on the trailers for hauling. The tractor makes the haul to destination. At that point, another fork truck removes the loads from the trailers and carries them to storage or point of use. With this teamwork arrangement, tractor-trailer trains eliminate the necessity for many extra trips by the fork trucks between source and destination of loads.

Maximum length of a tractor-trailer haul is limited by the amount of time consumed in travel. A tractor when fully loaded moves at about 3 mph. Hauls approaching one mile or more in length would inevitably consume costly amounts of time.

These long movements are, therefore, more in the field of shipping than of material handling. For distances exceeding 2000 ft, and particularly when the terrain is inclined or rough, the transportation of materials is usually done more economically by straddle-carrier trucks, road trucks, or railcars. In some plants, furthermore, continuous conveyors of the moving-sidewalk type, or tow-chain type, have been substituted to advantage for plant railroads.

As previously indicated, individual pieces or containers of material ranging from 4000 to 10,000 lb each in weight may be handled by crane-truck for the lower portion of this range, and by rubber-tired mobile crane for the heavier items.

When the handling activities in a given plant yard are not sufficiently high to warrant the economic operation of both a crane truck and a mobile crane, the choice between the two types inevitably lies in favor of the mobile crane in order to provide adequate capacity for the heavier items.

Courtesy Pettibone Mulliken Corp.

Fig. 6. Mobile crane yard application

Material objects handled economically by mobile cranes are not for any reason confined to the range of 4000 lb and up, per item. In fact, many are being handled economically which weigh but a fraction of this 4000-lb minimum.

The stockpiles of material items stored in the yard where a mobile crane is used are usually laid out so that the crane can perform its handling functions with a minimum of travel. The long boom on the crane is particularly useful in unloading gondola cars, and building high stacks. The depth of these stacks from aisle to aisle may be made equal to twice the length of the operating radius of the crane boom.

Furthermore, rubber-tired mobile cranes are sometimes also used inside the plant buildings for unloading bundled steel stock from gondola cars, thus relieving bridge cranes of some of this work. Mobile cranes can also be used to switch empty and loaded railcars.

When plant operations are largely dependent on the material stored in the yard, a yard delivery schedule can be set up each day to coincide with production schedules in the plant to provide a synchronized flow between the yard and the plant. The nucleus of such a delivery system could be a tractor-trailer train towed

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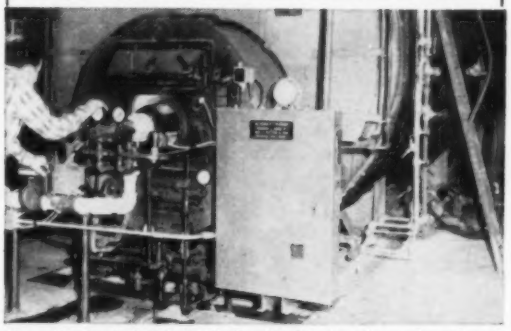

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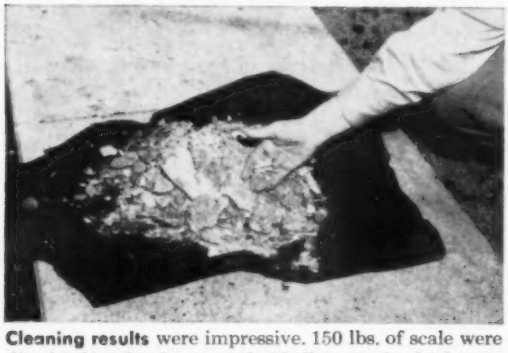

Cleaning results were impressive. 150 lbs. of scale were dissolved by the cleaner, only 3½ lbs. remained (above). The entire job took only 7 man-hours.

*Complete story on request from Du Pont.

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at various times by a tractor or a mobile crane and made up of four-wheel, low-bed trailers.

By hitching a trailer behind the mobile crane, the latter can perform its main function of lifting and piling material on the trailer without having to transport each item one at a time over long distances. The trailer follows the crane as it moves about the yard picking up items and loading them on the trailer.

Other similar trailers are loaded by fork trucks and overhead cranes where available. After the trailers have been loaded by whatever device just indicated, they are hitched to form a trainload and hauled by a yard utility tractor to manufacturing areas to be unloaded by fork truck or overhead traveling crane as the case may be.

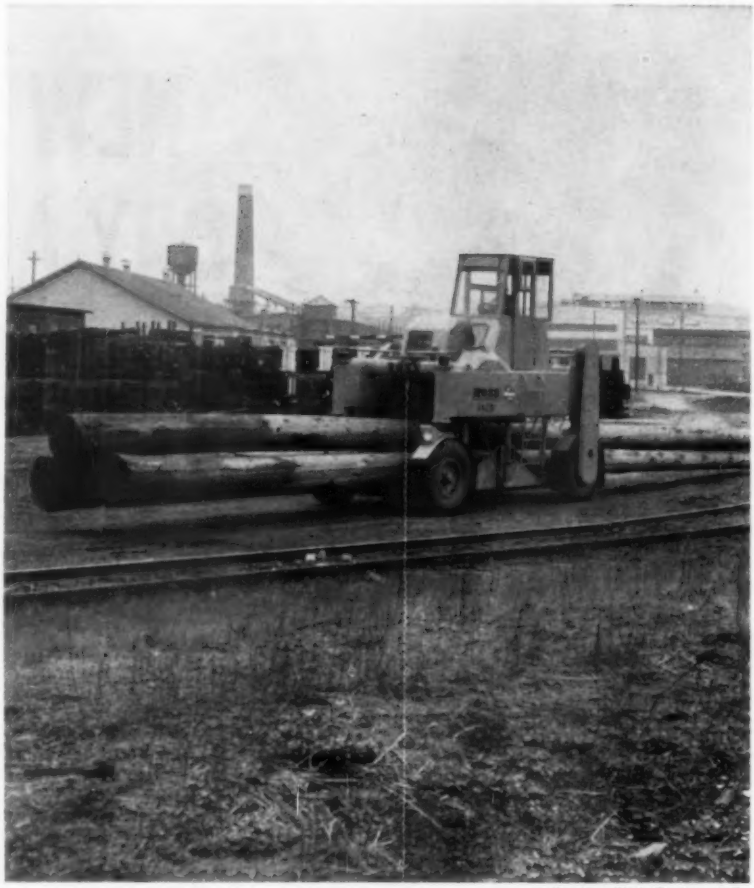
Railcar-mounted Cranes

Railcar-mounted cranes are also used in plant yards to spot cars as well as to handle raw materials by means of a magnet head. This type of mobile crane, sometimes incorrectly referred to as a "locomotive crane," is also often equipped with a clamshell bucket for handling bulk materials such as coal, coke, and sand.

Increasingly wide use is being made of straddle-carrier trucks, to carry heavy and bulky loads of various types of materials over long distances in plant yards and between plants separated by miles of distance along public highways. See Fig. 7. These materials include multiple pallet loads of items handled within a limited yard radius by fork trucks and tractor-trailer trains. They also include the various individual pieces of awkward shape and heavy weight handled singly or in secured lots by crane trucks and yard cranes. With a load capacity ranging up to 45,000 lb, and a travel speed above 25 mph, it is not uncommon for the movements of these trucks to range from 500 ft up to 3 or 4 miles per trip on regular assignments.

Straddle-carrier Shoes

A straddle-carrier is equipped with gripping shoes mounted on each side of the load tunnel framework under the carrier. These shoes spring outward to clear the load to be grasped. The truck then moves forward to inclose the load within the shoes. The load usually rests on portable supporting dunnage lengths called "bolsters." The shoes then close, lock, and pick up the bolsters on which the load is held firmly.



Courtesy Clark Equipment Co.

Fig. 7. Poles carried by a straddle truck in yard of main shops of a railroad. Such a carrier can handle bars, beams, and palletized loads besides lumber.

Although primarily designed for handling lumber, straddle-carriers have found wide application in industrial plant yards for handling long pieces such as poles, bars, rods, beams and girders. They also handle as many as ten pallet loads at a time which they pick up and discharge without auxiliary assistance. The operator of a straddle-carrier is able to perform these loading operations without leaving his control station on the carrier.

Another long-haul self-loading carrier used in yard storage activities is the side-loading truck. See Fig. 1. This one-man operated vehicle embodies the following characteristic features of three other distinct types of yard mobile equipment:

1. Stacks pallet loads like a fork truck.
2. Carries long loads like a straddle-carrier.
3. Delivers over long distances like a road truck.

The side-loading truck is especially suitable for handling long, awkward, heavy loads of steel, lumber, pipe, poles, girders, cases, and rows of pallet loads, ranging from 6 to 150 ft in length. The side-loading feature facilitates operation in 10-ft aisles. It handles loads up to 12,000 lb, and raises them up to 12 ft. Its travel speed ranges up to 30 mph. With crane-hook attachments on the lifting masts, it can also load and unload long items into and out of gondola cars, a feature not possessed by the straddle-carrier. **End**

"Take a tip from me—

One slip can cost more than USS Multigrip"

Have you safe-treaded *all* the danger spots in your plant and on your moving equipment? Accidents may be costly—but they can be prevented. The safe tread offered by USS Multigrip Floor Plate provides positive traction in any direction.

Multigrip is studded with hundreds of little cleats shaped like those on a football player's shoe. They are flat on top—comfortable to walk on—and safe, wet or dry.

Not only does Multigrip protect workers, but it protects floor surfaces, too. It is rugged, heavy-duty steel plate that will last for years with no maintenance. It's easy to keep clean. A quick "once over" with broom or hose will get it spick and span; there are no closed pockets to hold dirt, and water drains quickly in any direction. Get Multigrip from our local distributor near you.

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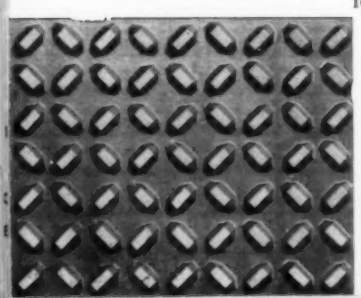

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USS United States Steel

For more facts circle 570 on Reply Card

Air Testing Equipment Goes on the Road to Help Fight Pollution

A MOBILE LABORATORY equipped with the latest devices for testing air filtering equipment will begin a nationwide tour, with visits planned to all major cities.

Offered as a new service to the air conditioning industry by Trion, Inc., of McKees Rocks, Pa., manufacturer of electronic air cleaning equipment, the laboratory has been outfitted in a 23-ft trailer. It will be operated by technicians thoroughly versed in air cleaning problems and their solutions. The main feature of the mobile laboratory is air testing equipment that duplicates that at the National Bureau of Standards.

Air filtering demonstrations will be given to groups interested in solving air cleaning problems. One piece of equipment of particular interest is the American Iron and Steel Institute Automatic Smoke Sampler which is designed to sample city atmosphere automatically for determination of smoke and haze concentration. Charts on all cities visited will be available for comparative purposes.

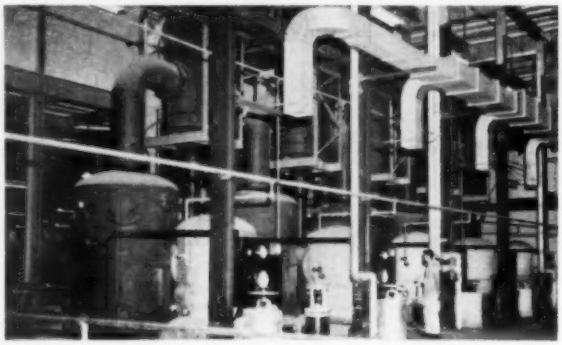
The testing equipment is portable and may be taken from the laboratory into industrial plants for demonstrations and test under actual operating conditions where a particular air cleaning problem exists.

Special Materials of Construction for Evaporators Handling Acidic Liquors

WATER, A VALUABLE COMMODITY in many manufacturing processes, is decidedly objectionable where it accumulates in and dilutes a processing liquid. In such cases, the mixture must be disposed of to waste at considerable loss, or some economical means found to remove the diluting water.

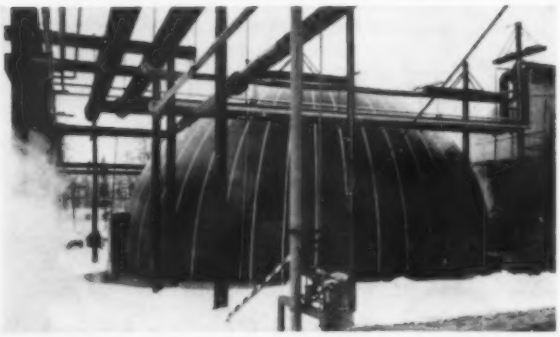
This problem—a common one to synthetic fiber producers—was solved at the American Enka Corporation rayon plant in Enka, N. C., by installing five single-effect vacuum evaporators. Each of the units, which consists of a heater and separator, can evaporate 14,000 lb of water an hour from the rayon spinning bath solution.

Because of the highly acidic character of the liquid, the manufacturer of the evaporators, Buflovak Equipment Div., Blaw-Knox Co. had to use special materials of construction to minimize structural corrosion. The heater section has rubber lined liquor and vapor chests, and Karbate graphite tubes. The tubes are cemented to flexible gaskets in the tube sheets. Tube sheets in four of the units are of lead, and in the other they are of Haveg, a resin-impregnated asbestos.



Air-Supported Building Houses Rail Car Tank Farm, Prevents Freezing

THREE RAILROAD TANK CARS, set on a spur track at the DuPont Company's Montague, Michigan Works, were protected from last winter's temperatures by an air-supported building "blown up" around them.



Heat was pumped into the neoprene-coated nylon shelter to prevent freezing of the tanks' contents. With this protection, the solutions could be pumped directly from the tanks into the plant's process line. Supplied by two 200,000-Btu heating coils in fan boxes, the heat input was designed to maintain 40 F inside the shelter.

The shelter was fabricated of Du Pont's Fairprene coated fabric—eight-ounce nylon fabric coated on both sides with neoprene synthetic rubber. The material remained flexible despite exposure to heavy snow, sleet, and extremely low temperatures recorded in Michigan.

Held erect by maintaining a small amount of air pressure within the unit, the 58-ft-diameter shelter was kept inflated by a static air pressure of five-eighths of an inch of water furnished by two 2000-cfm blowers. The building, designed to withstand 75-mph winds when both blowers are operating, was designed and fabricated by the Irving Air Chute Co., Lexington, Ky.

For more facts circle 571 on Reply Card——→

WRIGHT HOISTS & CRANES

ACCO

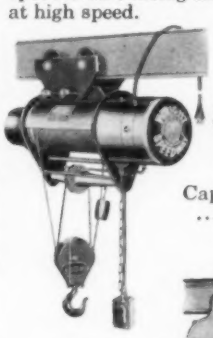
FOR LONGER LIFE • EASIER MAINTENANCE
LOWEST FINAL COST

WRIGHT *SPEEDWAYS*

Available with single, 2-speed or variable speeds and with a wide variety of mounting arrangements

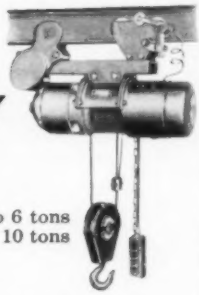
2-SPEED *SPEEDWAY* FRAME 1

Capacity ¼-ton to 1 ton. Two-speed, 1800/450 RPM motors permit precise, gentle positioning of work at slow speed... fast lifting and lowering at high speed.



***SPEEDWAY* FRAME 1½**

4-part reeved. Capacity to 2 tons ...relatively slow lifting speeds.



***SPEEDWAY* FRAME 2 FRAME 3**

Capacities—
Frame 2, ½-ton to 6 tons
Frame 3, 4 tons to 10 tons

NEW WRIGHT ELECTRIC CHAIN HOISTS

LIGHT—COMPACT—RUGGED—LOW COST

Two capacity ranges as pictured. Single Chain—300 to 2000 lbs. Double Chain—3000 to 4000 lbs.

Long Life—Safety—Minimum Maintenance are assured by—

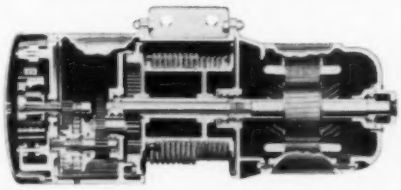
Alloy Steel Load Chain wick-oiled for longest life...heat-treated for long-wearing surface and ductile shock-resistant core—**Load Wheel, Hooks** and **Hook Couplings** drop-forged alloy steel—**Precision Ball Bearings** and **Gears** operate in oil bath—**Double Braking**—**Fewest Moving Parts.**

These Features make WRIGHT *SPEEDWAYS*

Capacities ¼-ton to 10 tons

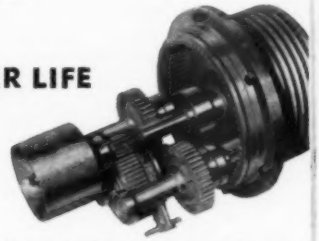
your best buy for—

MORE PRODUCTION



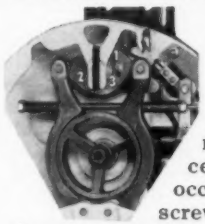
Fine balance and heavy-duty design make possible the continuous handling of tough jobs on any duty cycle for which a 30 minute NEMA motor is satisfactory. All gears and pinions are alloy steel, heat-treated. Their ductile core is shock resistant to severe service stresses. Anti-friction bearings throughout.

LONGER LIFE



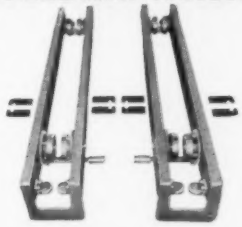
Strength of gear teeth of WRIGHT Frame 2 and Frame 3 *Speedway* Hoists has been doubled by a change in contour and grain structure of the metal. Internal gear ring with heavy flange cross section is bolted to drum at six points and provides extreme resistance to distortion.

EASIER MAINTENANCE



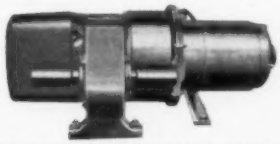
There is "*Nothing to Adjust but the Cam*" to keep the motor brake in perfect adjustment. When excessive load drift occurs...remove the screw shown at Position **1**, swing the cam until Position **2** is in line and replace the screw. Position **3** is provided for the final one-third of brake lining wear. Brake springs and solenoid never need adjustment!

Build Better Cranes Save Money too! with WRIGHT END TRUCKS CRANE DRIVE UNITS *SPEEDWAY* HOISTS



WRIGHT END TRUCKS

For motor-driven cranes and hand traveling cranes—both top-running and under-hung types. Timken Bearings throughout. Wide range of capacities up to 10 tons. Structural steel construction is lighter and stronger than cast frames.



WRIGHT CRANE DRIVE UNIT

For crane and double-beam trolley propulsion. Electric motor transmits power through fluid drive to well-proportioned gear reduction. Units are equipped with WRIGHT-designed solenoid "drag" brake. Size 1 Drive Unit has motors up to 2 HP...Size 2 has motors 3 HP to 7½ HP.

For Complete Information

Write for these Booklets—

DH-73A • New Electric Chain Hoist
DH-133D • Frame 1 *Speedways*
E-58 • Frame 2 & 3 *Speedways*

Motor Driven Cranes
DH-227 • Underhung, Single Bridge
DH-448A & DH-449A • Top-Running
DH-431C • Crane Drive Units

Wright Hoist Division
AMERICAN CHAIN & CABLE

York, Pa., Atlanta, Chicago, Denver, Detroit, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, San Francisco, Bridgeport, Conn.

NEW PLANT CONSTRUCTION —advance information on location, costs

Richmond, Calif. — Standard Oil Co. of California, 225 Bush St., San Francisco, Calif., has awarded a contract to the Fluor Corp., Los Angeles, Calif., for the engineering and construction of a 55,000 bbl per day fluid catalytic cracking plant at company refinery here. Construction will begin at once with completion of the unit scheduled for the summer of 1959. New installation reported to represent an investment of approximately $15 million.

Englewood, Colo.—Garden Farm, Inc., Sealtest National Dairy Products Corp., Denver, Colo., plans to erect a large new dairy processing plant on building site, this city. Work will get under way at once on new facility which will cost about $1 million. Krey & Hunt, 292 Madison Ave., New York, N. Y., is consulting engineer of the project.

Danbury, Conn.—Mosler Safe Co., 322 Fifth Ave., New York, N. Y., plans to construct a new plant to house a company affiliate, Mosler Research Products, Inc. The one-story structure will include administrative offices, laboratories and production facilities.

Tampa, Fla.—Swift & Co., Adhesive Products Department, 4200 Packers Ave., Chicago, Ill., plans to construct a new manufacturing plant here. Plant will be installed with modern manufacturing equipment to produce a wide variety of industrial adhesives, designed to fit the needs of the Florida industries, including specialized resins and rubber based products in emulsion and solvents, liquid dextrose, pastes and animal glues. Work on the new facility will begin at once for completion early in 1959.

Brunswick, Ga.—Bestwall Gypsum Co., Ardmore, Pa., plans to construct large new facilities here for the production of company's line of building materials. Work on the multi-million dollar plant will begin at once. Plant will have a capacity of 300 million sq ft of gypsum board and lath products annually. Plant is scheduled to be in operation in 1959.

Joliet, Ill.—Olin Mathieson Chemical Corp., Mathieson Building, Baltimore, Md., plans to construct a large one-story paper converting plant on tract of land here. New building of brick and steel construction will have a floor area of more than 170,000 sq ft. Work will be under the supervision of Campbell Lowrie Lautermilch, 400 W. Madison St., Chicago, Ill. Plant will represent an investment in excess of $2 million. F. H. McGraw Co., New York, N. Y., is the consulting engineer.

Wood River, Ill.—Shell Oil Co., 50 W. 50th St., New York, N. Y., plans a major expansion and improvement of company facilities for the manufacture of lubricating oils at local refinery here. Multi-million dollar project includes construction of two new plants and expansion and improvement of the dewaxing and de-asphalting units. In addition, truck and barge shipping facilities will be enlarged. Construction will begin at once for completion by mid-1959.

Elkhart, Ind.—Miles Laboratories, Inc., 1127 Myrtle Ave., plans to expand company's citric acid production facilities at local plant here. Construction on the new expansion will begin in the fall for completion in about one year. When completed, project reported to cost in excess of $4.5 million, will enable company to more than double output of product.

Indianapolis, Ind. — Fairmount Glass Works, 1301 S. Keystone Ave., plans an addition to present facilities here to house four automatic bottle-making machines, an annealing oven, a two-story packing and selection room, warehouse facilities and installation of two bottle-making machines. Cost of plant addition, with equipment, reported to be $3 million. Toledo Engineering Co., 3001 Sylvania Ave., Toledo, O., is consulting engineer of project.

Kosmosdal Ky. — Kosmos Portland Cement Co., Starks Building, Louisville, Ky., plans expansion of local plant here for increased cement capacity. Plant expansion and additions will be made to increase production by 45 per cent to a total of 3.2 million bbl annually. Work on addition and new facilities will begin soon for completion by the summer of 1959.

Russellville, Ky.—Southern States Cooperative, Richmond, Va., has announced plans for the construction of a large plant for the production of granular fertilizer on building site near here. Plant scheduled to begin operation in the spring of 1959, will have an annual production capacity of 60,000 tons. Work on the unit is already under way and will cost approximately $750,000 when completed.

Waltham, Mass. — Sylvania Electric Products Co., 1740 Broadway, New York, N. Y., plans a development test site for company's Plato anti-missile, missile system at the Fort Devens Army base near here. Company is prime contractor and system manager on the project for the Army Ordnance Corps. Site will be used for extensive field tests for electronic elements and antennaes for long-range radar.

Detroit, Mich.—Bendix Aviation Corp., Fisher Building, plans major expansion of its filter division plant in suburban Madison Heights. Construction on the new addition has already begun and will add 14 per cent additionl floor area to the plant. High temperature filters, formerly made at the company plant in Van Nuys, Calif., and used extensively in aircraft and production, will be manufactured in the new addition.

Grand Rapids, Mich.—Blandin Paper Co., First National Bank Building, St. Paul, Minn., plans major expansion of company's facilities here, for the manufacture of coated paper, widely used in the magazine publishing field. Plans call for the installation of a new paper coating machine. Cost of additional equipment and plant addition reported to be about $1.5 million. Work is scheduled to be completed in 1960.

Kansas City, Mo.—Sheffield Steel Division-Armco Steel Corp., 1938 Shepherd Ave., has awarded contract involving the expenditure of $10 million to the Rust Engineering Co., 930 Fort Duquesne Blvd., Pittsburgh, Pa., for the construction of a new rod mill building at company headquarters here. Work will proceed as soon as preliminary engineering work is completed, and plant is expected to be in operation by late 1959.

Princeton, N. J. — Columbian Carbon Co., 139 S. Main St., Dayton, O., plans to increase its research facilities at company's new $1-million research quarters, now under construction, here. New research headquarters will comprise two one-story buildings connected by a 10-ft corridor. Project is scheduled for completion by the spring of 1959.

Union, N. J.—Schering Corp., Bloomfield, N. J., will start construction of a new micro-biological research and development center here. Construction of the new building, three stories high, 60 ft wide and 126 ft long, will begin soon for completion by the summer of 1959 at a cost of $1.5 million.

Bronx, N. Y.—Herold Radio & Electronics Corp. will lease the property being constructed by Irving J. Feder Co. for the manufacture of high fidelity stereophonic phonographs and radios. Construction of the $2-million one-story plant will begin at once. Plant will occupy 120,000 sq ft and will be one of the largest single floor industrial plants in the metropolitan area.

Fulton, N. Y.—Nestle Company, Inc., 2 Williams St., White Plains, N. Y., plans to construct a new building here for the processing of milk. The building will have a floor area of approximately 35,000 sq ft. New facility, scheduled for completion in early 1959, will represent an investment, with equipment, in excess of $2 million.

This Wissco Belt passes continuously through a brazing furnace, then a water cooling jacket, 24 hours a day, five days a week. After six months: not a single belt breakdown and no lengthening reported.

FAMOUS NAMES *ride on* WISSCO BELTS

Long Manufacturing Division— Borg-Warner Corporation

The story of Wissco Belts is best told by their users. For instance, Mr. Henry Colenso, Plant Engineer of the Long Manufacturing Division, Detroit, Michigan says:

"Our Wissco Belt has enabled us to increase our production almost 4% by eliminating downtime due to belt replacement and slack take-up."

The belt carries oil coolers through a brazing furnace operating at a temperature of 2090°F . . . then runs through a water jacket which cools the belt to room temperature.

"The thicker belts we used previously could not stand the stress caused by these sudden large temperature changes," Mr. Colenso reports. "They would stretch so that the conveyor had to be stopped for about three hours every week while two or three feet of slack were cut out and repairs made. And we lost a full day's production on this portion of the line once every four months, while the belt was completely replaced. Our total annual loss due to these stoppages alone amounted to almost 4% of our overall production.

"Since our Wissco Belt was installed about six months ago, we have not had one single belt breakdown. The main reason for its continued successful operation is its thin, flat spiral construction," Mr. Colenso continues. "The spirals in the belt are preseated during manufacture, and the belt has not stretched during operation. Compared with other belts we have used, and we've made many experiments, the Wissco Belt has proven outstanding for long life and continuous service."

What Wissco Belts have done for Long Manufacturing, they can do for you in your processing-conveying operations. For further information contact the sales office nearest you.

5921

THE COLORADO FUEL AND IRON CORPORATION—Denver and Oakland
WICKWIRE SPENCER STEEL DIVISION
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WISSCO BELTS
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THE COLORADO FUEL AND IRON CORPORATION

CF&I

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INVINCIBLE
Vacuum Units Reclaim ....

bolts
broken glass
carbon black
chemicals
coal dust
coffee
cotter pins
core sand
cork
crushed stone
dirt
explosives
fabricated parts
fertilizer
flour
fly ash
fly lint
frit
gold
grains
grindings
lead
liquids
metal dusts
nuts
paper dust
plastics
powder
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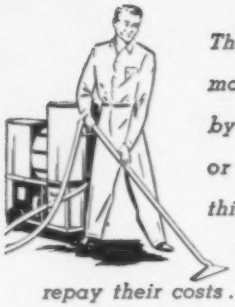
sugar
talc
water



These are only some of the materials successfully handled by Invincibles—by recovering or reclaiming almost anything that will pass through a vacuum hose, they quickly repay their costs . . . Invincibles also serve as vacuum cleaners, keeping plants clean, safe and more productive by removing all industrial dust and dirt . . . Over 100,000 Invincibles are in use—5,000 for over 25 years. Let Invincible engineers apply their more than 50 years of experience to your reclaiming or cleaning problem.

FREE BOOKLET

illustrates valuable industrial uses of Invincible Vacuum Units. *Ask for it!*

Model 809-B—an extra-heavy duty unit (5 HP). Other models from ½ to 7½ HP.

INVINCIBLE VACUUM CLEANER MFG. CO.
DOVER, OHIO

OVER 50 YEARS THE LEADER IN INDUSTRIAL VACUUM EQUIPMENT

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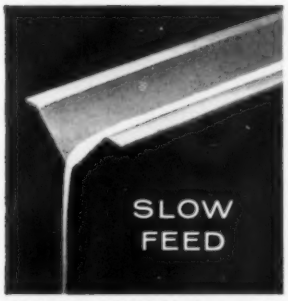
As filled capsules are inspected at Abbott Laboratories, North Chicago, Illinois, the girl suits the speed of the Jeffrey feeder to her requirements with the hand rheostat.



FLOW CONTROL is possible within wide limits, simply by changing feeder's amplitude of vibration.

A way to do what "can't" be done...
JEFFREY Vibrating Feeders

Jobs once considered too costly, too hazardous, or just plain impossible are being done with Jeffrey electric vibrating feeders . . . handling a tremendous variety of materials, densities from 4 to 400 pounds per cubic foot, one micron in size to four-foot cubes, a few ounces to 2,000 tons per hour.

With Jeffrey feeders, the operator has instant and absolute control over the flow of material. This control may be manual or automatic, depending upon equipment that follows, to insure optimum loading. Thus a plant and its workers can produce at top efficiency.

Jeffrey engineers are expert in applying vibrating equipment to all types of processes, and are available to help solve your feeding and conveying problems. Catalog 870 describes these feeders. The Jeffrey Manufacturing Co., 853 North Fourth St., Columbus 16, Ohio.

CONVEYING • PROCESSING • MINING EQUIPMENT...TRANSMISSION MACHINERY...CONTRACT MANUFACTURING

JEFFREY

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Correct Lubrication in Action...

Production Increased

Removing plastic radio cabinet from an injection press. Santay Corporation pioneered in plastics technology, creating special machinery and processes. From here, intricate, highly finished plastic products are furnished to America's most prominent appliance manufacturers.

Mobil

Complete Engineering Program
Proved Petroleum Products

Mobil

SOCONY MOBIL OIL CO., INC., and Affiliates: MAGNOLIA PETROLEUM CO., GENERAL PETROLEUM CORP., MOBIL OVERSEAS OIL CO., INC.

27.1% *no additional capital investment!*

Santay Corporation finds new ways to increase production of plastics products with the help of Socony Mobil

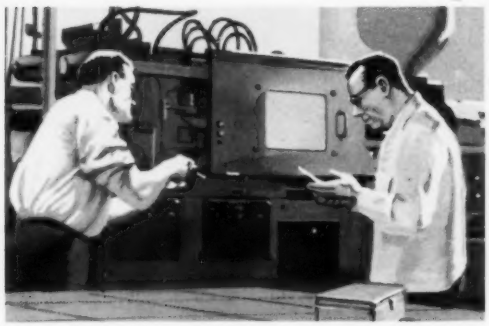
Competition is at its fiercest in the plastics business. Any unnecessary overhead costs can cut the heart out of profits. For this reason Santay management continually looks long and hard for ways to cut downtime, increase production.

In 1954 a Mobil Correct Lubrication Program was installed throughout the plant. This comprehensive engineering service had these results, according to Santay's plant engineer: "The reduction in downtime, three years after the Mobil program started, accounted for 27.1% increase in production *with no additional capital investment.*"

This outstanding result was achieved by close cooperation between Santay plant personnel and Mobil. Press operations were closely studied . . . lubrication procedures constantly improved . . . records prepared to show downtime and service frequency on every machine . . . cleanliness of lubricant carefully watched. All this help is *yours* when you rely on Mobil. Why accept less?

Problem: Downtime on a key press could result in a loss of $250 per hour in product sales. *Cause:* Maintenance follow-through not fully developed. *Solution:* Plant-wide Mobil Program that cut downtime over 25% in first year.

Oil Control saves 40% on oil purchases. Under Mobil Program, hydraulic oil is reconditioned . . . oil checked regularly for viscosity and contamination. *Result:* Oil purchases kept to minimum, maximum machine protection assured.



Problem: Matching molds on injection press worked out of alignment. *Cause:* Excessive wear on toggle pins and bushings. Lubricant didn't stick to wear surfaces. *Solution:* Mobil recommended oil that "stays put" . . . avoided $800 shutdowns.

Cost Control: Every machine has its control card. Alert watch is kept for press slowdowns, high maintenance. As a result, Santay maintenance personnel with Mobil assistance can move quickly to keep production high, costs low.

Correct Lubrication

Another reason You're Miles Ahead with Mobil!

It's a P&H HEVI-LIFT HOIST with maintenance-free RCD brake

In handling steel sheets, beams, and tubes, this 6,000-lb. capacity Hevi-Lift® frequently is loaded beyond rated capacity. Yet downtime is half what you'd expect.

Maintenance records show that more than 50% of hoist troubles occur at the brake. But not so with a P&H Hevi-Lift. Its mill-type RCD brake has fewer parts to break down. Total brake movement is only 1/32 of an inch — there's no violent hammer-action to cause wear.

Send for Bulletin H-5 which tells you the complete story of P&H Hevi-Lifts (capacities, 1,000-40,000 lbs.) See your P&H distributor — or write Dept 206C, Harnischfeger Corp., Milwaukee 46, Wisconsin.

HARNISCHFEGER

P&H ... quality and service for 74 years

For more facts circle 575 on Reply Card

Copon Arocoat—the Proven Epoxy-Coal Tar Coating

Unique formula cures quickly into a tough, tightly bonded, abrasion resistant shield against corrosive chemicals and fumes.

Copon Arocoat, the newest member of the Copon line of coatings specifically designed for corrosion control, is providing new answers for many of industry's toughest and most expensive corrosion problems.

Arocoat has been used profitably to cut traditional corrosion losses in paper mills . . . to add new life to condensate tanks and vessels, hopper cars, casing and conveyors . . . to provide internal or external protection for acid, alkali, sour crude and brine storage tanks . . . to reduce maintenance costs on cooling tower equipment.

Economically applied by spray or brush, it has also been used to provide superior protection for marine equipment and submerged, buried and exposed gas and petroleum transmission lines.

If you have a corrosion problem that seems to defy profitable solution, get complete information on Copon Arocoat. Write today to the Copon Associate located nearest to your city.

Copon.

FOR CORROSION CONTROL

Normal Copon — the versatile maintenance coating • **Activated Copon** — for greater chemical resistance • **Copon Mastic** — high build for critical areas • **Copon Met-L-Pon** — the metallic zinc coating • **Copon High Bake** — the ultimate in chemical-resistant coatings.

COPON ASSOCIATES

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JAMES B. SIPE and COMPANY, INC.
P. O. Box 8010, Pittsburgh 16, Pa.

SOCIETE DES VERNIS PYROLAC
51, Rue De Lechat Creteil (Seine), France

WILBUR & WILLIAMS COMPANY
130 Lincoln Street, Boston 35, Mass.

Mail to the Copon Associate located nearest your city.

_____Send complete information on Copon Arocoat.

_____I would like to discuss a corrosion problem with one of your technical representatives.

NAME_____

TITLE_____

FIRM_____

ADDRESS_____

CITY_____ STATE_____

For more facts circle 576 on Reply Card

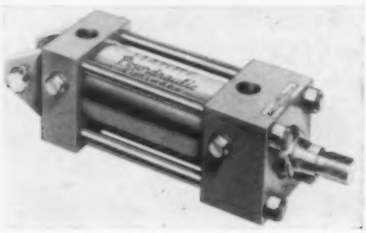
NEW PRODUCTS AND PROCESSES summarized for your convenience

Edited by M. E. Heniken

Use the Reader Service Cards provided on pages 171-172 to ask for more information on these products. Circle item numbers of products in which you are interested.

1—HYDRAULIC CYLINDER with unique tube seal

The Powrdraulic line of hydraulic cylinders features a pressure tightening tube seal — an 0-ring located on the outside diameter of the tube and confined between the tube and cylinder head. Because this seal is on the tube's outside diameter, minute ex-

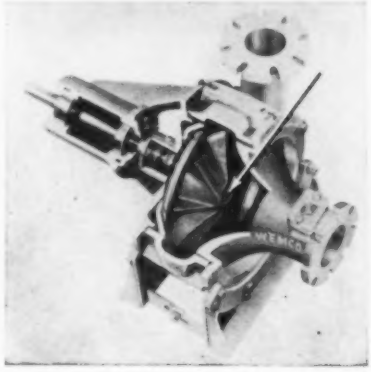


pansion of the tube under pressure squeezes the 0-ring, increasing tightness of the seal, it is explained, and this seal remains tight at all pressures. Powrdraulic Cylinders are rated at 2000 to 3000 psi non-shock. Bore sizes range from 1½ through 8 in., and there are 13 basic models and a choice of rod sizes. One-piece solid steel heads with welded mountings give added strength. Details in Catalog 900. Hanna Engineering Works.

2—SOLIDS PUMP designed to eliminate clogging

In the Wemco Torque-Flow Pump a recessed impeller, located out of the flow pattern, produces a swirling motion transmitted to the fluid at the suction line by impeller action. Suction and discharge water become a continuous open passage from suction flange to discharge flange. The pump operates by transmitting power to a fluid pulp, as in a fluid type torque converter. It creates a vortex effect, causing pulp in main pump body to rotate. Particles and solids drawn into the vortex of the swirling liquid are discharged with a centrifugal sweep from the open chamber, it is explained, seldom touching the impeller (see arrow in photo).

According to manufacturer, this pump handles anything that will enter the suction because of the complete open case — and is completely nonclogging. The pump is reported to handle coarse, abrasive, soft or fibrous materials — even frothy pulps. Low cost operation is also claimed, as the same design features providing protection to solids being pumped, also



provide protection against excessive wear to the pump itself. Already in successful service in sewage and sludge handling installations, the Wemco Torque-Flow Pump is expected to have broad industrial application. Among the variety of materials announced as pumpable with it are cement, fruit, fish, pharmaceuticals, coal waste, garbage, paper pulps and rags. Capacities range to 3000 gpm and heads to 120 ft. Bulletin PIO-B6 gives furthur details on this pump. Western Machinery Co.

3—PLASTIC PIPE, flexible, has a white core

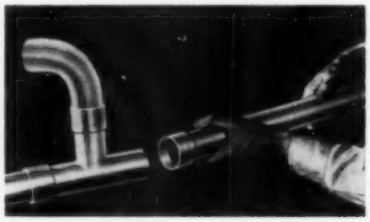
Puritan White Core is a flexible polythylene pipe with a white core, and is introduced for conveying water or other liquids for human consumption. This pipe is claimed to overcome certain disadvantages associated with many materials used for transporting potable water, and to have the excellent corrosive resistance to any type of water characteristic of regular polythelene pipe. The white core—to which no carbon black has been added —makes possible "antiseptic white" conditions, it is pointed out. Quaker Rubber Div., H. K. Porter Co., Inc.

4—FLOOR SEAL dries fast, and resists abrasion

For wood or concrete floors, Tremseal is a synthetic elastomer wh.ch, according to manufacturer, has marked advantages over many hardeners. Benefits cited are faster drying time, twice the abrasion resistance of conventional type seals, better adhesion, and exceptional resistance to oil and grease. Tremseal is reported ready for foot traffic in 3 hrs., for heavy traffic after 24 hr. The Tremco Mfg. Co.

5—CONNECTOR simplifies piping system assembly

Brazed or welded connection of stainless piping systems is said to be completed more easily with a stainless aligning connector that fits over the ends of pipe or fittings to provide a socket-type joint. The connector provides a snug fit to hold pipe and fittings in position until welding or braz-



ing secures the connection. It also permits in-place preassembly of complicated process piping layouts. Designed to be used with company's Speedline fittings and lightwall piping systems, Schedules 5 and 10, this connector fits over the fittings as well as the pipe since the extra straight section on the Speedline fittings provides clearance for assembly. Speedline Div., Horace T. Potts Co.

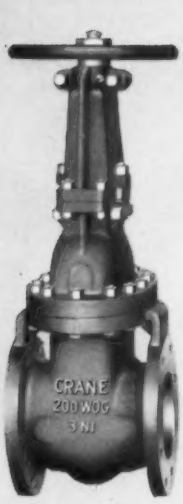
6—FLAT-PLATE BATTERY for small power uses

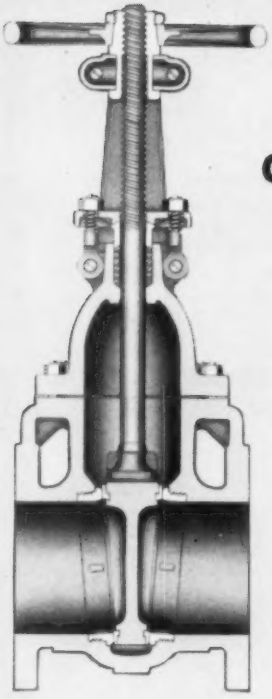
PWA Batteries are flat-plate stationary storage type designed to meet small power applications at moderate cost. Despite their economy for such uses, the batteries feature corrosion resistant grid material, an explosion-control device, and shock-absorbent plastic containers. Announced as meeting specifications for many telephone applications, these lead-acid batteries are also suggested for microwave systems, emergency lighting.

These batteries will be marketed in two- and three-cell polystyrene containers with seven or 13 plates per cell. The seven-plate ones are rated at 50 amp-hr at the 8-hr discharge rate. Thirteen-plate sizes are rated at 100 amp-hr. The positive plates contain Silvium, an alloy of silver, lead

NEW CRANE VALVES FOR PROCESS INDUSTRIES

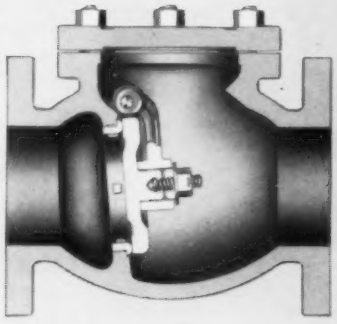
3% NICKEL ALLOY CAST IRON





Gates and Swing Checks

18-8 SMo (Type 316) Alloy Trimmed



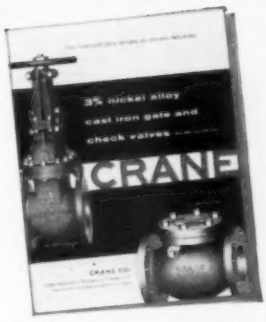
11 SIZES — 2 TO 18 INCHES

Better Corrosion Resistance . . . Longer Life . . . on More Fluids

This metal—Crane 3% nickel alloy iron—was developed especially to extend the usefulness and economy of cast iron valves in the process industries.

At but slightly higher cost, Crane 3% nickel iron valves provide substantially better resistance to corrosion than ordinary cast iron, and they have notably higher physical properties. Efficiency is stepped up further with Crane 18-8 SMo (Type 316) stainless steel trim.

Typical Recommended Applications: You will save with these valves —in the petroleum industry, for example—on oils containing traces of mineral acids; in wood-treating processes—on creosote vapors and oils; in pulp and paper mills—on alkaline liquors of various kinds. In general, they should be considered where all-iron or brass-trimmed iron valves are subject to seat corrosion.



ASK FOR THIS CIRCULAR

Complete technical and specification data on these valves are given in Circular AD-2313. Ask your Crane Representative for a copy, or write to address below.

CRANE VALVES & FITTINGS

PIPE • PLUMBING • KITCHENS • HEATING • AIR CONDITIONING

Since 1855—Crane Co., General Offices: Chicago 5, Ill.—Branches and Wholesalers Serving All Areas

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NEW PRODUCTS

(Begins on page 140)

and other metals, having high resistance to electrolytic corrosion and claimed to extend battery life and protect against damage by overcharging. The explosion-control device consists of a polystyrene hood or baffle over the plates which collects gases and channels them through a cylinder vent and plastic vent plug. Exide Industrial Div., The Electric Storage Battery Co.

7—DOCK PLATE is low priced, light weight

The Truckers Special Dock Plate is described as low in cost, safe and strong, and about one-third the weight of a similar steel plate. It is made of high strength aluminum alloy in standard sizes from 48-by-24 to 48-by-48

in. These dock plates are in the light to medium-duty range, for axle loads to 5000 lb. Various lengths service height differences up to 7 in. between truck bed and dock, it is pointed out, and still keep ends flush. A steel clip angle is bolted underneath the plate to hold it in position between truck and dock, and the plate is crowned for smooth, fast equipment cross-over. The dock plate's width is marked by a strip of "safety yellow" paint on each edge. Magnesium Co. of America.

8—FLOORING with ingrained texture chip design

Non-directional graining extending through its ⅛-in. thickness is a feature of the Imperial series of Excelon Tile. Since this is not just a surface treatment, the design cannot "wear off" no matter how much traffic the floor receives, company states. Eight patterns featuring several color combinations are available in this vinyl asbestos flooring, and in each pattern, various tones of the basic coloring are incorporated in "accent chips" scattered random-fashion through the flooring. Imperial Excelon Tile is reported fire retardant, easily maintained, and resistant to greases, alkalis and dilute acids. Armstrong Cork Co.

9—FORM BOARD for industrial contsruction uses

Fiberglas Industrial Form Board is designed for installation in exposed areas in plants, warehouses and industrial areas not requiring whiteness and light reflection. It is described as a flight-free, light tan, mat-faced product which performs several functions. It serves as a permanent form for poured-in-place lightweight roof decks, as an interior ceiling, as an acoustical ceiling, and as roof insulation. Manufacturer says the form board is incombustible and an efficient thermal and acoustical board, absorbing up to 75 per cent of the noise striking it. It comes in sizes of 32 by 48 in., and 24 in. by purlin spacing to 96 in. Thicknesses range from 1 to 2 in. Owens-Corning Fiberglas Corp.

10—HEAT EXCHANGERS with cold weather protection

In these models of company's Sectional Aero Heat Exchangers, operation is protected from freezing in extreme winter climates, it is announced. The machine's basic principle is the cooling of a liquid by the evaporation of a small amount of water on the surface of tubes through which the liquid passes—the machine maintaining temperature control within close limits by varying amount of outdoor air flow across coils, adjusting capacity to load, removing heat at rate of input.

The new "winter-summer" models enclose the air modulating dampers in a casing and provide for restriction of the air supply by a manually operated damper in winter climates where the temperature remains below freezing temperatures for extended periods. Automatic modulating damper operation continues, maintaining close temperature control. Heat supply for warm-up periods or between shut-downs is available from an outside source. Applications are to industrial fluid cooling systems, liquids and air and gases, and temperature control of chemical processes. Niagara Blower Co.

11—NYLON AIR HOSE has "built-in" recoil action

Nycoil, a lightweight nylon air hose for use with pneumatic tools, incorporates snap-back action to keep it out of the way of work. Claimed to

be tough, heat resistant and unaffected by oil, kerosene and gasoline, it is suggested as a general purpose air hose. According to manufacturer, the hose withstands high operation pressures as well or better than rubber hose; its abrasion and chemical resistance are superior and its smooth inside surface means less resistance to air flow. Nycoil comes in 3/16- and ¼-in. ID sizes in a standard 25-ft length, with flare fittings. Nycoil Co.

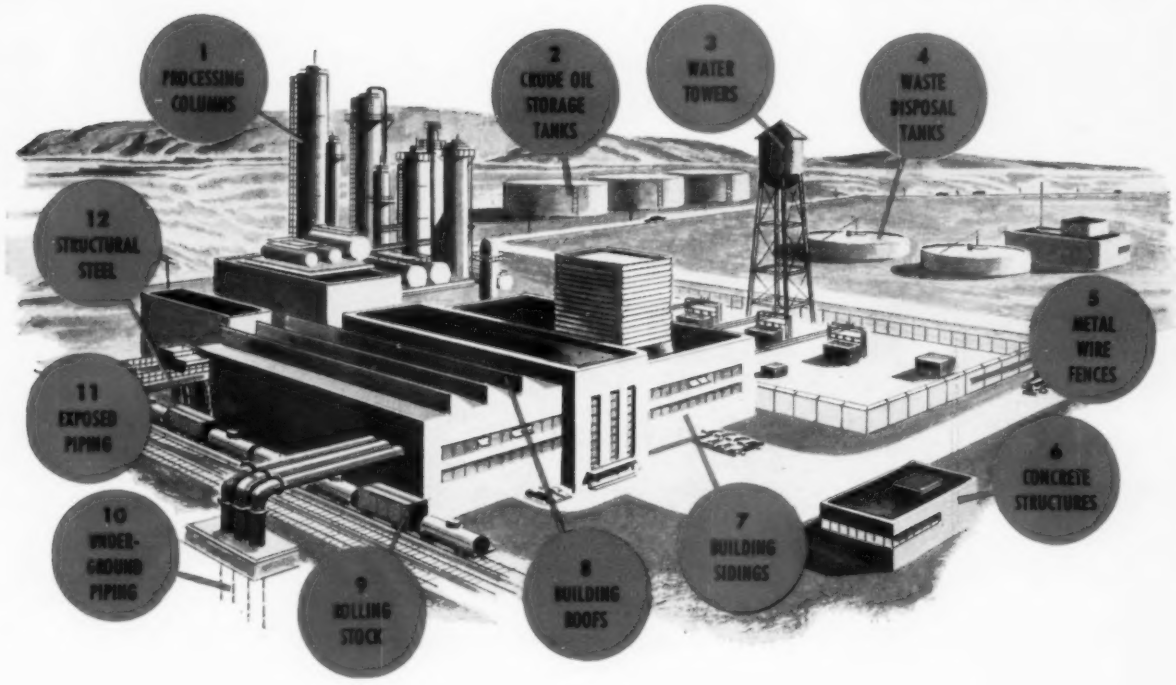
12—NON-SKID FINISH makes plant floors safer

Non-skid Safety Floor Finish is a colored, paint-like material to which an abrasive grit has been added to provide a durable, slip-resisting surface. It is intended for both interior and exterior use, with various wet or dry surface conditions and is claimed unaffected by oil. It may be brushed or trowelled on metal, wood and concrete floors and dries in about 6 hrs. It may be cleaned with household detergents, company says, and slip-proofing is maintained even after extended use. It comes in red and in two shades of gray. Manufacturer suggests it for stairways, ramps, walkways and especially around industrial machinery. Lewbill Industries, Inc.

13—COLOR-CODED DRAWERS promote storage efficiency

These small-parts drawers are now available in any of 12 bright colors. They permit ready color-coding for fast visual identification of stored material, parts or file cards, and are part of manufacturer's functional multiple-purpose system called "storage wall." The system consists of nests of drawers that can be stacked together to form a self-supporting partition, or erected against building walls, installed underneath or above shop work benches. Basic building blocks of the system are

Solve Your Plant's Toughest Corrosion Problems with these PITT CHEM Coatings



1. Processing Columns—For corrosion control alone, use *Insul-Mastic 4010* gilsonite-asphalt vaporseal. For insulation and corrosion protection, use *Insul-Mastic 553* Type D with incorporated cork granules.

2. Crude Oil Storage Tanks—For bottom and top of interiors, use patented PITT CHEM *Tarset* coal tar-epoxy resin coating. For exterior use *Insul-Mastic 4010, 553* or PITT CHEM *101* coal tar coating.

3. Water Towers—For interior, use tasteless, odorless PITT CHEM *104* coal tar coating. For exterior, use *Insul-Mastic 4010.*

4. Waste Disposal Tanks—Use acid and alkali-resisting *Tarset* or tough, heavy-bodied PITT CHEM *101.*

5. Metal Wire Fences—Apply weather-resisting PITT CHEM *102* coal tar coating with roller or brush.

6. Concrete Structures—Use *Insul-Mastic 4010* vaporseal or *Mica-Mastic 5402,* a synthetic resin coating containing white mica, specifically compounded for waterproofing and decorating masonry.

7. Building Sidings—Weatherproof with *Insul-Mastic 4010* and finish with *Insul-Mastic Color Coat.* Available in eight shades, *Color Coat* is specifically designed for use over PITT CHEM coal tar and *Insul-Mastic* coatings.

8. Building Roofs—Use *Insul-Mastic* roofing coatings outside. For condensation control and insulation on underside, use *Insul-Mastic 553.*

9. Rolling Stock—Apply *Insul-Mastic Dednox* coatings for protection of frames, box car ends and roofs of railroad cars.

10. Underground Piping—Use PITT CHEM *Tarset* or PITT CHEM *101* heavy duty coal tar coating.

11. Exposed Piping—Protect with *Tarset or Insul-Mastic 4010* and code with *Insul-Mastic Color Coat.*

12. Structural Steel—Apply economical, weather-sealing *Insul-Mastic 4010.*

THERE's hardly a corrosion problem around your plant that can't be controlled with a PITT CHEM coal tar or INSUL-MASTIC gilsonite-asphalt coating. From ordinary weatherproofing to stopping tough chemical and underground corrosion, there's a PITT CHEM coating to do the job efficiently and economically.

Pitt Chem Industrial Coatings are available through leading Industrial Distributors. See the "Yellow Pages" of your telephone directory.

PROTECTIVE COATINGS • COAL CHEMICALS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

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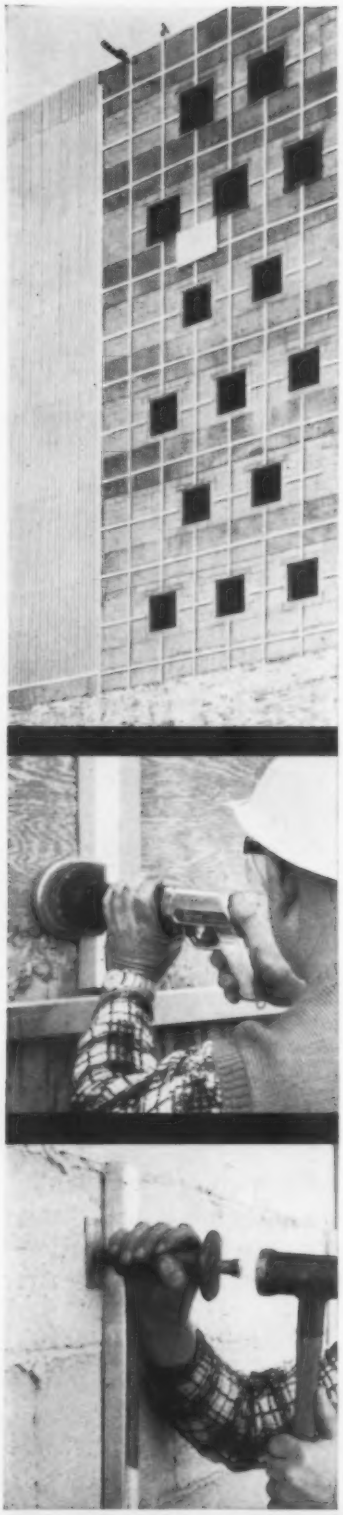


HIT THE DOUBLE JACKPOT!

Save 40% in time, labor, materials with Ramset and Shure-Set!

That's what a Baltimore contractor saved . . . 40%. That's the kind of saving you can expect when you use—

RAMSET for heavy-duty fastening to steel and solid concrete . . . SHURE-SET for light fastening to masonry and concrete block!

You get the lowest in-place cost without drilling, bolting or plugging. No power lines, no bulky equipment. You increase your profit two ways on *every* job!

Ramset®

Powder-actuated RAMSET is up to 15 times faster than old-style fastening methods. Completely portable. Every RAMSET fastener is 100% guaranteed, and it's Austempered for high hardness combined with maximum toughness.

Shure-Set®

SHURE-SET drives like a nail, holds like an anchor . . . uses every ounce of power behind every hammer blow. Uses no cartridge. Sets pins faster, more securely—without bending or breaking . . . right through light-gauge metal.

Ask your RAMSET dealer to supply both tools. Look under "Tools" in the yellow pages, or write for free booklet *today!*

OLIN MATHIESON CHEMICAL CORPORATION — Ramset

Ramset Fastening System

WINCHESTER-WESTERN DIVISION
OLIN MATHIESON CHEMICAL CORPORATION

12133-H Berea Road • Cleveland 11, Ohio

For more facts circle 579 on Reply Card

NEW PRODUCTS

(Begins on page 140)

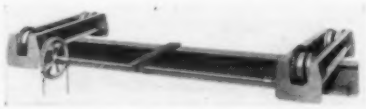
steel drawer cases and these come in the same range of colors as the drawers. Standard Pressed Steel Co.

14—HEAT EXCHANGER for the process industry

Designated Type C-100, this pre-engineered, standardized line of exchangers offers extreme flexibility in materials, sizes and arrangement of components, mounting position, tube side passes, and nozzle orientation. Adaptable for use as heaters, coolers, vaporizers or condensers, the exchangers can be built to handle any combination of liquids or gases. Featuring a floating head and removable bundle, they are available in one, two and four pass designs. Because of their versatility, they are also suited to general applications. Ross Heat Exchanger Div., American-Standard.

15—PACKAGED CRANES in capacities to 10 tons

The Load Lifter line of underhung crane kits, designated the NH-SUH Crane Assembly, provides packaged cranes in capacities from ½ to 10 tons with spans up to 50 ft. Each kit includes two assembled end trucks, re-



quired cross shaft bracket and bearing assemblies and shaft couplings, 20-ft hand chain, chain wheel with guide, and a set of assembly instructions. Bridge I-beam and shaft are purchased locally. Among features announced for these do-it-yourself cranes are end truck construction designed for use on tapered or straight flanged beams, and hardened steel wheels which permit hand-geared or motorized operation without alterations. By merely arranging spacer washers on wheel axles, end trucks fit 8- to 24-in. I-beams. Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

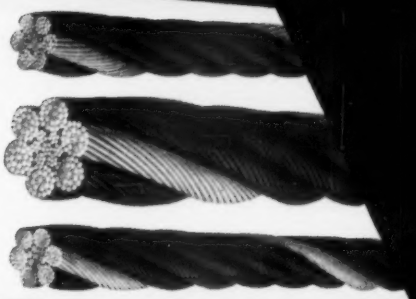
16—LIQUID TREATMENT prevents concrete dusting

Radon 401 is described as an easily-applied, one-coat liquid treatment to prevent "dusting" of concrete floors. It is said to penetrate deeply, bind small concrete particles together and retard their progressive breakaway under traffic, and to fill surface capillaries with tough, resilient plastic rubber. It

WIRE ROPE

You can get the **right** rope no matter what your equipment need . . . when you buy from our thousand-and-one types, sizes, and grades of wire rope.

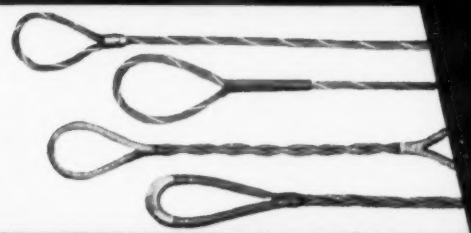
Monarch Whyte Strand wire rope is available PREformed and Internally Lubricated, in Lang Lay, Regular Lay, and with Independent Wire Rope Core or Fiber Core. Ropes are made of Bright Steel, Galvanized Steel, Stainless Steel, Monel Metal and Plastic Coated. They are supplied properly lubricated and fabricated to serve well under the severest service conditions. Ask for Monarch Whyte Strand Bulletin 5425.



You're buying a service... when you buy Macwhyte Wire Rope!

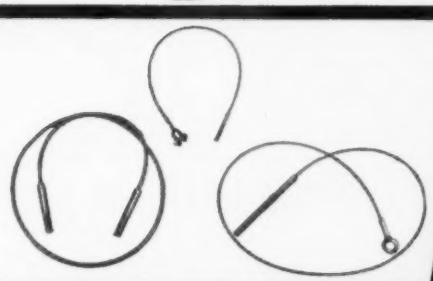
SLINGS

Hundreds of sizes and types of Macwhyte wire rope slings are designed with the lightness, flexibility, and handling ease you need for efficient, low-cost material handling. Three body styles are made: ATLAS Round-Braided, DREW Flat-Braided, MONARCH Single-Part. Ask for your free copy of Sling Data Bulletin 5308-R.



WIRE ROPE ASSEMBLIES

Safe-Lock wire rope assemblies are made in a wide range of sizes for machine parts, controls, and operating devices. They are prefabricated to the exact size and length you need—ready-to-use for safe, easy, quick, low-cost installation. Ask for Bulletin 57126.



Your local Macwhyte representative is as handy as your phone — and he'll gladly help you select the right wire rope, sling, or cable assembly to meet your need.

His recommendations are based on wide experience in solving industrial wire rope problems . . . and he can easily provide a solution from Macwhyte's 1001 wire ropes. Don't guess about wire rope when you can be sure! Ask for a Macwhyte wire rope specification, and watch your yearly rope costs drop when you use the *right* rope!

MACWHYTE Wire Rope COMPANY

MACWHYTE WIRE ROPE COMPANY, 2991 Fourteenth Avenue, Kenosha, Wisconsin
Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cables and Assemblies, Monel Metal, Stainless Steel, Plastic Coated and Nylon Coated Wire Rope, and Wire Rope Assemblies. Special catalogs available.

MILL DEPOTS: New York 4, 35 Water St. • **Pittsburgh 36,** P. O. Box 10916, 353 Curry Hollow Road • **Detroit 3,** 75 Oakman Blvd. • **Chicago 6,** 228 S. Desplaines St. • **St. Paul 14,** 2356 Hampden Ave. • **Ft. Worth 1,** P. O. Box 605 • **Portland 9,** 1603 N. W. 14th Ave. • **Seattle 4,** 87 Holgate St. **San Francisco 7,** 188 King St. • **Los Angeles 33,** 185 South Myers Street

125

For more facts circle 580 on Reply Card

Life in these excited states...

"We've been having trouble with corrosion in this section."

Corrosion is embarrassing

It's *expensive*, too. Not only in terms of equipment chewed up, but also in un-timely time losses and wasted ingredients. You save embarrassment and expense *both* with Ace chemical resistant piping, valves, pumps, tanks, and special lined equipment. 108 years' experience at your service.

RIVICLOR *for ageless strength*

All-purpose rigid PVC. Sched. 40, 80 & 120, ½ to 4". Threaded or socket-weld fittings. Valves ½ to 2". NSF-approved. *Bul. CE-56.*

NEW *ACE Gear Pump*

Improved design . . . now 12 gpm. All wetted parts acid-resistant, wear-resistant Ace hard rubber. Finest available. *Bul. CE-55.*

SUPPLEX *tops in economy*

Flexible poly pipe, ideal for water lines, drains, underground pipe or conduit. Sizes ½ to 2", long coils, NSF-approved for drinking water. *Bul. CE-57.*

VALVE HEADQUARTERS

World's best chemical valves . . . at moderate prices. All-plastic, rubber-lined, or all-hard-rubber. ⅛" pet cocks to 24" gate valves.

ACE processing equipment of rubber and plastics

AMERICAN HARD RUBBER COMPANY
DIVISION OF AMERACE CORPORATION
Ace Road • Butler, New Jersey

For more facts circle 581 on Reply Card

NEW PRODUCTS

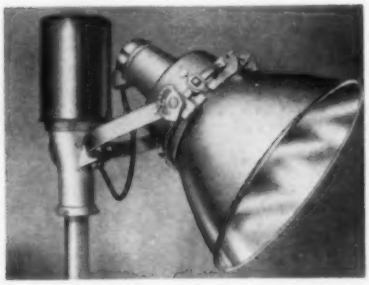
(Begins on page 140)

is a companion product to manufacturer's concrete floor densifier, Densicon 76. Radon is applied by pouring over a small area of floor surface—then flow coated with a long-handled soft-bristled floor sweep or lamb's wool applicator. A gallon conditions 250 to 400 sq ft, depending on porosity and texture of surface. Radon floors may be opened to traffic 3 hr after application, says manufacturer. In addition to preventing floor-dusting Radon, due to its plastic rubber content, is reported to provide floor surface resilience and to be practically free of surface build-up. Maintenance Inc.

More information on any of these products can be yours without cost or obligation. Just circle the item numbers on the Reader Service Cards provided on pages 171-172.

17—1000-W MV FLOODLIGHT is versatile in application

Several features are announced for the Type MVF Mercury Vapor Floodlight, a general purpose unit. These include rear door relamping with posi-

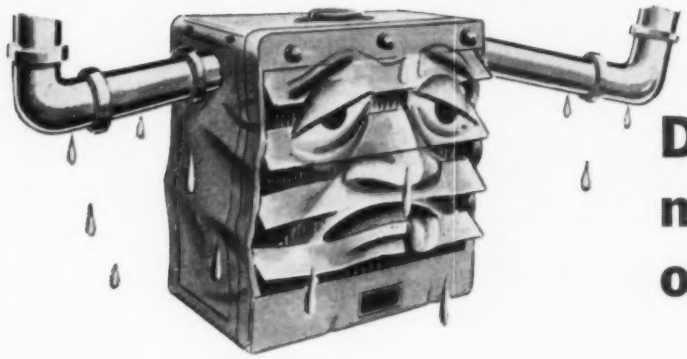


tive locking in open position; spun-sealed lens; choice of three reflectors; choice of four lenses; assemblies complete with ballast; and use of clear bulb or phosphor coated lamps. Choice of lenses and reflectors produce a variety of beam spreads and candlepowers. Beams as narrow as 75 deg or as wide as 163 can be obtained, and candlepower as high as 236,000. Ballasts listed with the Type MVF are designed to operate the lamps in weather as cold as —30 F. Crouse-Hinds Co.

18—SOLID FILM LUBE is resin bonded

Surf-Kote H-108 contains a molybdenum disulfide compound bonded directly to metal surfaces by a resinous

BEWARE!



Don't waste money repairing old unit heaters

Replace with new units and cut maintenance costs, improve performance, avoid shutdowns

Every heating season, thousands of old unit heaters begin to fail. Frequently failure is caused by unfavorable boiler-water conditions which promote and accelerate internal corrosion. Sometimes it's due to improper venting or trapping. Often, general maintenance neglect is to blame. But even with careful maintenance, it's not uncommon for units 10 to 15 years old to begin to show signs of wear . . . lose efficiency . . . develop leaks.

One Little Leak Can Mean the Start of Skyrocketing Maintenance Costs. In *time* alone, it costs from $25 to $300 to disconnect, take down and reinstall a unit heater, depending on size, type and mounting height. Add to this the actual repairs — and the final cost is prohibitive. What's more, when a leak appears, it's almost a sure bet that the unit is weak in other places. Chances are, new leaks will develop soon — and with increasing frequency.

A Planned Replacement Program Can Avoid Costly Production Delays. Service records show that the majority of unit heater failures occur during coldest weather . . . frequently interrupt production at critical times. With a well-planned replacement program, heating failures can be anticipated. Units can be replaced in the summer months without shutdowns.

In some plants, units are *automatically scheduled for replacement* after they have been in service for a pre-determined number of years . . . usually after they have been depreciated on the company's books.

A Modine Replacement Program Offers Many Cost Advantages. In teaming with Modine to establish your own replacement program, you avoid shutdowns and the expense of frequent (often useless) repairs. Also, you get the many benefits of new Modine efficiency.

Motors are designed for lower power consumption. Sealed-in bearings eliminate need for periodic lubrication. New vertical fins discourage accumulation of dirt, lint and other materials. Other Modine features include improved structural strength and durability . . . quieter operation . . . lighter weight. They add up to low-cost maintenance, better heating performance and greater fuel economy.

Find out how *YOU* can replace unit heaters with new Modines and save money. Use the coupon to get full information.

MODINE MANUFACTURING COMPANY
1563 DeKoven Ave., Racine, Wisconsin

I would like full information on replacement costs ☐; also wall chart and "Repair or Replace?" bulletin ☐.

Name .....
Firm .....
Address .....
.....

SU-1371

FREE ON REQUEST — Useful, new 22" x 24" wall chart of unit heater maintenance tips. Shows what to look for when units aren't performing right. Also, Modine's new "Repair or Replace?" bulletin. Mail the coupon today!

Modine
MANUFACTURING COMPANY

In Canada: Sarco Canada, Ltd., Toronto, Ont.

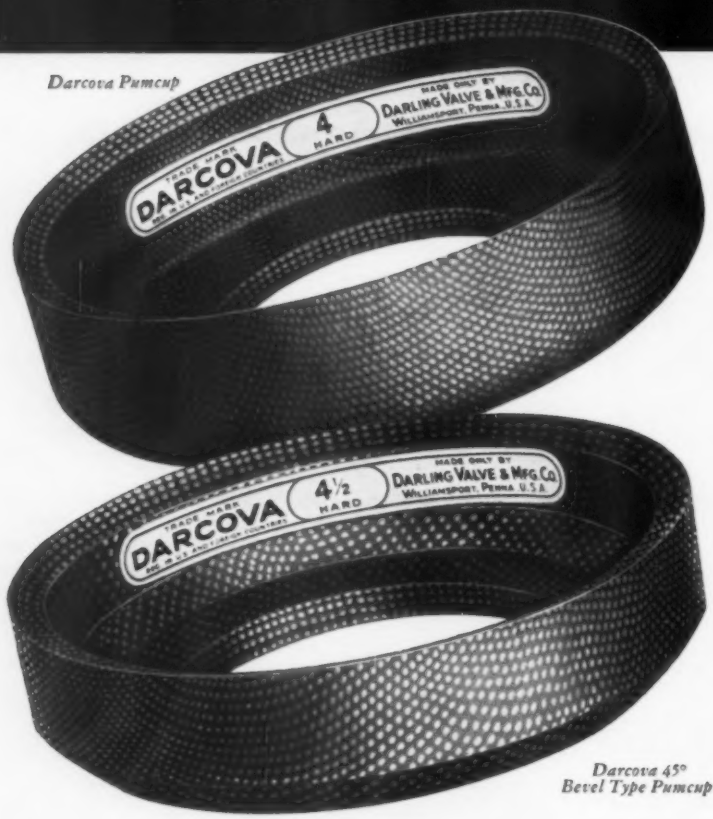
For more facts circle 582 on Reply Card

DARCOVA PUMCUPS

now available with

100% NYLON COMPOSITION

for HYDRAULIC CONTROLS, AIR CYLINDERS, RECIPROCATING PUMPS



Darcova Pumcup

Darcova 45° Bevel Type Pumcup

DARLING Pumcups—long noted for unequalled efficiency and life in all kinds of cylinders—are now greatly exceeding their own performance records! The new 100% Nylon Composition, available *only* in Darcova Pumcups, does it!

Nylon Pumcups are made in sizes, types and textures exactly right for your particular equipment—ready *now* to give you unprecedented piston packing performance!

Write for helpful data Bulletin No. 5503.

DARLING VALVE & MANUFACTURING CO.

Williamsport 14, Pa.

DARCOVA — THE ORIGINAL COMPOSITION CUP

TRADE MARK PUMCUPS

For more facts circle 583 on Reply Card

NEW PRODUCTS

(Begins on page 140)

material, forming a solid, dry film of lubrication. This film serves to prevent contact between metal surfaces providing a low coefficient of friction to eliminate galling, seizing, cold welding and fretting corrosion. The lubricant is claimed to remain unaffected by humidity or unusual atmospheres, and to be impervious to oils, greases, solvents, acids and alkalis. It is applied by spraying, dipping or brushing. Hohman Plating & Mfg. Co.

19—D-C DRIVES feature static power conversion

Ultraflex Packaged Drives utilize light, compact static power components to replace the conventional motor generator set. Ultraflex conversion units eliminate bearings, brushes, commutators, shafts and couplings, manufacturer points out; compactness of

the drive permits worthwhile savings in floor area required, and reduction in weight permits wall mounting of many sizes. Simplified circuitry in the conversion units facilitate installation and maintenance of the drives.

These drives come in two forms: Ultraflex E, a 1 to 40 hp electronic adjustable speed drive; and Ultraflex M, a 1 to 200 hp magnetic amplifier adjustable speed drive. Both include three basic components: an enclosed panel, housing the conversion and control units; an operator's station; and an industrial d-c motor. The operator's station incorporates start-stop pushbuttons and a speed adjusting potentiometer or regulator. Cutler-Hammer Inc.

20—DUST COLLECTORS have wide application range

Series C Centrifugal Collectors offer efficient air cleaning and dust collection using centrifugal force, it is announced, with minimum cost and maintenance. Two design types, totaling 41 sizes are available. Design 3 Collector is for shavings, sawdust,

102,000 lbs. of steel was unloaded, sorted and stockpiled in one hour with the help of this American 300 Series Self Propelled Crane. A complete line of American Cranes and Excavators provide fast, maneuverable, versatile materials handling equipment for every application.

Working a clamshell bucket is just one of many jobs American DiesELectric Locomotive Cranes handle with cost-saving efficiency. This self contained crane will also work with hook, magnet, orange peel or grapple fronts —has ample power to switch railroad cars, too!

TRIGGER FAST AIR CONTROLS BOOST CRANE'S OUTPUT 20%

Fast, highly responsive air controls actually increase the daily production output of big American DiesELectric* Locomotive Cranes by 20%! Leading firms in the country's heavy industries have swung to American for their volume materials handling jobs. These cost-conscious firms have learned that the American's patented diesel-electric power system cuts operating costs sharply. Electrically driven trucks provide smooth switching and car spotting power while reducing maintenance costs up to 50%! Dependable diesel power on the machinery deck results in low cost materials handling power.

A variety of fronts . . . hook, clamshell, magnet, orange peel or grapple . . . provides every industry with a versatile, heavy duty, high production machine that will pay for itself in a hurry.

If you're interested in boosting handling volume while trimming costs, investigate American's new concept in crane design—the DiesELectric Locomotive Crane! Specifications on this complete line offering capacities from 25 to 130 tons are available immediately by writing:

*trademark

EXCAVATORS-CRANES
to 2 yds.-50 tons
LOCOMOTIVE CRANES
to 130 tons
DERRICKS-HOISTS
to 800 tons
REVOLVER CRANES
to 400 tons

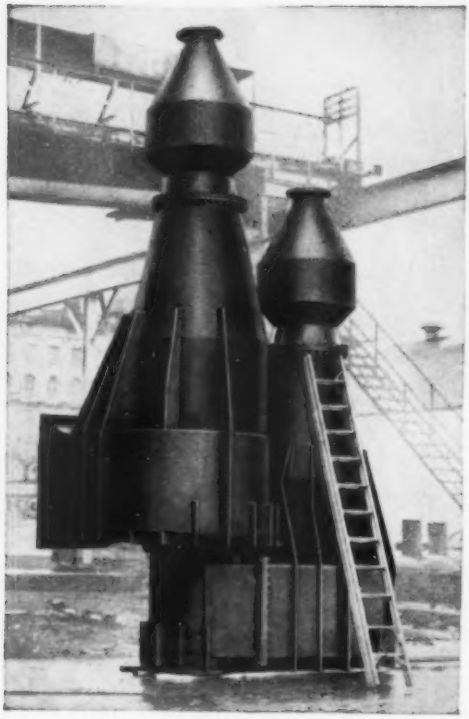
AMERICAN HOIST
and Derrick Company
St. Paul 7, Minnesota

AMERICAN HOIST PACIFIC COMPANY
Special materials handling equipment

CROSBY-LAUGHLIN DIVISION
Drop forged fittings for wire rope-chain

A limited number of locomotive cranes available for rental service

For more facts circle 584 on Reply Card

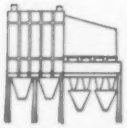


Exploring new frontiers!

But these aren't satellite launchers, though they're specially designed for high temperature operation: they're Buell extra-efficient cyclone dust collectors . . . and the new frontiers they're exploring are in industry. Everywhere in American industry, from cement mills to refineries, from chemical plants to power generating stations, Buell collectors set new records in percentage of dust removed, low maintenance, and improved plant operation. Even in the age-old field of fly ash collection, Buell extra efficiency pays off. Only *Buell* cyclones have the unique Shave-off port that traps small fines in the double eddy currents. And Buell large-diameter design eliminates bridging, clogging, or plugging. *All three* Buell Systems are illustrated and described in "The Collection and Recovery of Industrial Dusts". Write for a copy to Dept. 14-H, Buell Engineering Company, Inc., 123 William St., New York 38, N. Y.

BUELL CYCLONES

"SF" ELECTRIC PRECIPITATORS



PRECIPITATOR-CYCLONE COMBINATIONS

buell®

Experts at delivering Extra Efficiency in

DUST COLLECTION SYSTEMS

For more facts circle 585 on Reply Card

NEW PRODUCTS

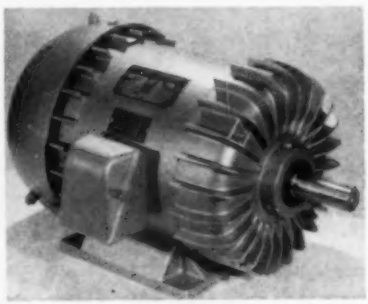
(Begins on page 140)

polishing, buffing and similar uses where dust size will run above 325 mesh (44 microns), but may contain small percentages down to 20 microns. Air inlets and dust outlets are of generous size to handle usual stray bulk objects. They are also used on shredded plant refuse. At standard air density and normal rating, collectors operate at 2 in. water column S.P.

Equipped with relatively small diameter, long cone, Design 5 Collector is designed for dust sizes below 44 microns, such as coal, foundry, flour, cement. Normally rated at 4 in. water column S.P. at standard air density, collectors can be utilized for high efficiency down to 20 microns on all sizes, manufacturer states. Only small diameter units may be used in range from 5 to 10 microns. Capacities from 260 to 6500 cfm are available. The Kirk & Blum Mfg. Co.

21—ENCLOSED MOTORS in ratings from 1 to 500 hp

An industrial line of totally enclosed and explosion proof motors, from 1 to 500 hp is available in the new NEMA frames through 365U, the old NEMA frames through 505, and standard in-



dustrial frames above 505 through 500 hp. Features announced by manufacturer include recessed Neoprene slingers on output shaft, fool-proof lubrication system, stainless steel connection and name plates, shock resistant fan covers. All models have indexed leads and a balanced insulation system claimed impervious to moisture and corrosive atmospheres. Oversize conduit boxes are standard in the line for easy installation. Electric Motor Div., A. O. Smith Corp.

22—TIME CONTROL works six electrical circuits

Automatic heating, lighting, ventilating and air conditioning can be accurately and flexibly operated by this master time control, it is announced.

CAFETERIA—WEST PENN POWER COMPANY
Natco Ceramic Glaze Vitritile "6T" Series
Architects—
Hoffman and Crumpton, Pittsburgh, Pa.
Contractor—O. H. Martin, Sharpsburg, Pa.

Natco Ceramic Glaze Vitritile... choice of custodian—contractor—consultant and chairman of the board

SIZES AND SHAPES

Series	Shape Catalogs	Tile Face Size	Nominal Thickness
"8W"	8W-257	7¾" x 15¾"	2", 4"
"6T"	6T-657	5⅛" x 11¾"	2", 4", 6", 8"
"4D"	4D-1255	5⅛" x 7¾"	2", 4", 6", 8"

A versatile building material must meet the needs of the entire "team." For the cost-conscious executive who approves its purchase, Natco Ceramic Glaze Vitritile offers moderate initial investment, attractive appearance and long-term economy. Costly replacement and renovation are minimized because Natco Vitritile is resistant to acids, alkalies, fire and physical abuse.

Maintenance men prefer Natco tile interiors because they are easy to clean. Occasional soap and water cleansing insures a sparkling, new appearance for the life of the building. Its impervious finish makes Natco Vitritile the ideal material where sanitation is of prime importance.

For the craftsmen who install it, Natco Vitritile provides both structural strength and a handsome, permanent interior finish *in a single unit . . . placed in just one operation.*

Available in large unit face sizes as listed below. A complete line of shapes and sizes in both structural units and in "soaps" is further assurance that Natco Vitritile will adapt to any design.

Consult your nearest Natco branch office for complete details.

NATCO CORPORATION

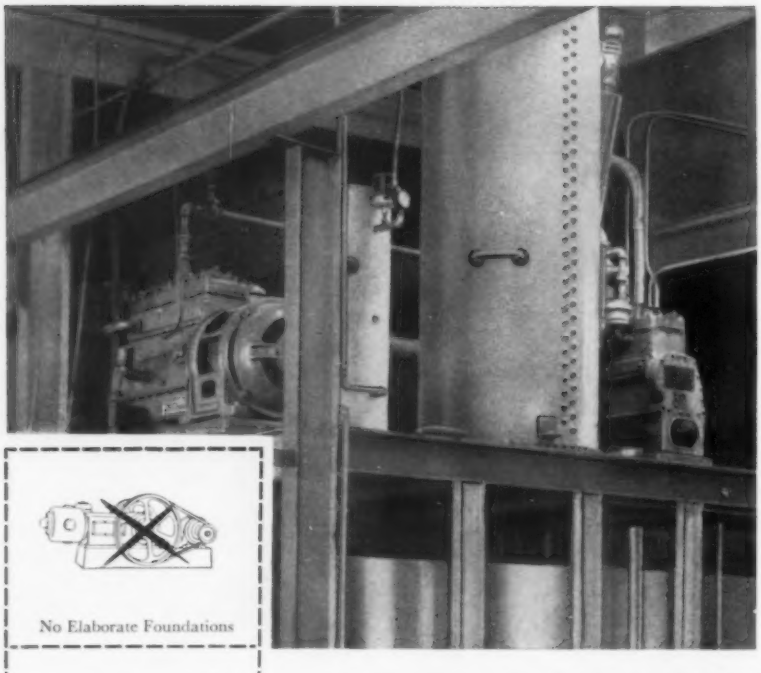
NATCO Quality Clay Products Since 1889

FTI Structural Facing Tile Institute

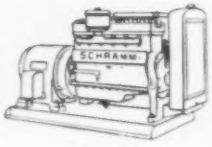
GENERAL OFFICES: 327 Fifth Avenue, Pittsburgh 22, Pa.

BRANCH SALES OFFICES: Boston • Chicago • Detroit • New York • Philadelphia • Pittsburgh Syracuse • Birmingham, Alabama • Brazil, Indiana • **IN CANADA:** Natco Clay Products Ltd., Toronto

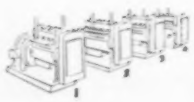
For more facts circle 586 on Reply Card



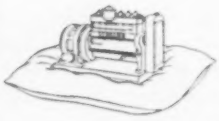
No Elaborate Foundations



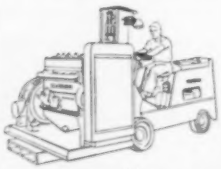
Compact



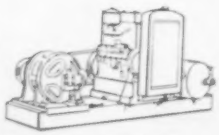
Unit System



No Vibration



Easy to Move



Complete Package

NO ELABORATE FOUNDATIONS

Schramm Compressors are vibration-free!

Any floor space will serve as a base for Schramm Compressors. There's no need of special foundations; in fact, Schramm Compressors don't even have to be fastened to the floor. Balanced reciprocating parts assure vibrationless operation, longer life. And vibration-free Schramm Compressors are easier on your building. Direct drive or V-belt driven to suit your exact needs.

Compact—Schramm Compressors take less space, can be located anywhere. Take advantage of unused corners.

Unit System—No need for costly centrally located compressors and long air lines. Use only the compressors you need—add to them as requirements grow.

No Vibration—Balanced reciprocating parts provide smooth operation, lengthen compressor life.

Easy to Move—Change the location of your compressor to suit your needs. Shorten your air lines. Meet changes in production plans.

Complete Package—All you need for your air requirements in a single package.

For complete information, write for Catalogs GC-57 and 5510, or see your nearest Schramm Dealer.

See the Yellow Pages for local Sales, Service and Rental of Schramm Air Compressors.

Schramm, Inc.

MANUFACTURERS OF AIR COMPRESSORS

665 North Garfield Ave. • West Chester, Pa.

For more facts circle 587 on Reply Card

NEW PRODUCTS

(Begins on page 140)

With six individual circuits, the control can also operate electric doors or illuminated signs. It can also sound program bells when equipped with a duration switch. Since each circuit can be individually timed, on a 24-hr basis, each automatic operation can have its own "on" and "off" timing, manufacturer explains, and only one wire is required for each circuit.

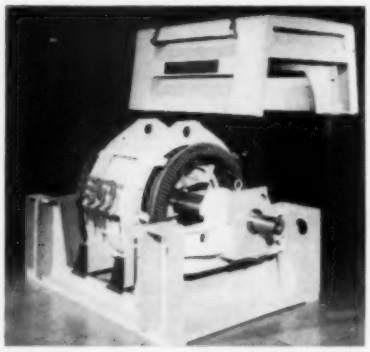
There is a quick-change calendar device, providing for silencing of any circuit during any 12-hr period of the week. A duration switch with a range of 2-25 sec is also provided. If automatic operation is not desired, each circuit can be manually controlled. The compact unit measures 6½ in. deep, less than 15 in. high. Each circuit is rated at 15 amp at 115 v. Cincinnati Time Recorder Co.

To receive product data circle item numbers on the handy Reader Service Cards provided on pages 171-172.

23—LARGE A-C MOTORS are fully accessible

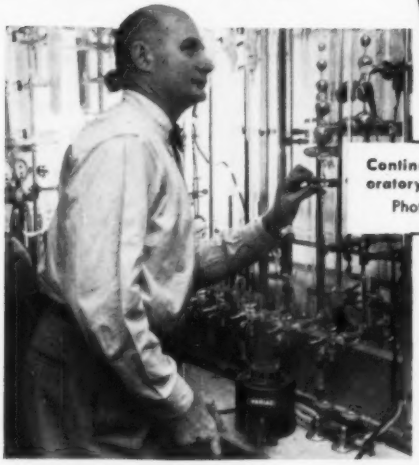
Design of the F/A (Fully Accessible) Motor lets enclosure be manufactured independent of the wound stator. During assembly, the enclosure is merely bolted to the base of the motor making the wound stator fully accessible when required. Previously, the enclosure was welded or cast as part of the wound stator, limiting accessibility. As a result, this manufacturer's complete line of squirrel-cage, wound rotor, and synchronous motors from 250 to 7000 hp (depending on speed) for horizontal utility and industrial drive applications have been redesigned to use only six basic enclosures and 30 frame sizes as compared to the 450 frame sizes formerly used.

Among key advantages announced are these: The stator is accessible for



- Good Regulation • Smooth Control
- Long Life • High Efficiency
- Operation from 50 to 400 Cycles

Variac®- THE CONTROL THAT SOLVES THESE MANY PROBLEMS



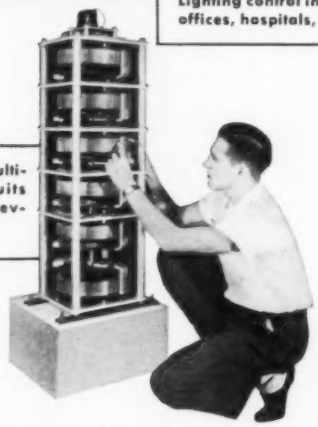
Continuously-adjustable a-c voltage for laboratory research and development work.
Photo Courtesy Bell Telephone Laboratories

Control of electric heaters and ovens in laboratories and pilot plants.
Radiation Counter Laboratories

Compact, reliable OEM component for all types of equipment and machinery.
Consolidated Electrodynamics Corp.

Lighting control in theaters, photographic studios, offices, hospitals, auditoriums, and public places.

Process-control tool in production operations.
Western Electric Company



Control of multi-phase circuits with aid of several Variacs.

Variacs alone, or with supplementary transformers, can solve most a-c control problems. They operate from standard 115v or 230v a-c lines and provide continuously adjustable output from zero to 17% above line voltage (135v or 270v). Variacs are available in many models with current ratings ranging from 2.4 to 50 amperes, and may be ganged for additional capacity or polyphase operation. Wherever a-c power is available, Variacs are useful for efficient control of Light . . . Heat . . . Speed . . . Mechanical and Electrical Power.

Variacs have Duratrak contact surfaces of plated silver-alloy to eliminate oxidation problems which occur with bare copper brush tracks . . . they withstand initial surges ten times rated current . . . Variacs can be easily designed into equipment for either panel, behind panel, wall, or table mounting . . . available with ball bearings, or motor driven . . . military-type Variacs are also stocked for 350- to 1200-cycle service . . . all Variacs are covered by a Two-Year Warranty, additional life insurance for designers and manufacturers who build equipment for long trouble-free service.

GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Mass., U. S. A.

NEW YORK AREA: Tel. N. Y. WOrth 4-2722, N. J. WHitney 3-3140 **CHICAGO:** Tel. VIllage 8-9400
PHILADELPHIA: Tel. HAncock 4-7419 **WASHINGTON, D. C.:** Tel. JUniper 5-1088
SAN FRANCISCO: Tel. WHitecliff 8-8233 **LOS ANGELES 38:** Tel. HOllywood 9-6201
In CANADA, TORONTO: Tel. CHerry 6-2171

For more facts circle 588 on Reply Card

TRIBUNE FINAL

Closing New York Stock Prices Page 8C

PRICE 5 CENTS

LARGE LOSS FIRE DAMAGE HIGHEST IN HISTORY

National Board of Fire Underwriters Blame Structural Deficiencies For Staggering Increase

Large fire losses are the highest ever, with a resulting toll of suffering and dollars, according to the National Board of Fire Underwriters. Experts blame lack of effective fire stop materials and partitions in structures as a serious contributing factor. Give your property the *extra proven protection* of wire glass. Mississippi Wire Glass, approved Fire Retardant #32, tends to bottle up fire . . . helps prevent it from roaring into a costly conflagration. For positive protection that no glass substitute can offer, insist on Mississippi Wire Glass—the original upon which the Underwriters standard was based in 1899—the standard today by which all others are judged.

Trial by Fire!

In this dramatic Underwriters Laboratory test, the glass is first subjected to temperatures ranging up to 1600° F., and later to a ¾" stream from a fire hose at 35 to 40 lbs. pressure. Passing the test requires that glass remain in sash, unchanged except for cracking due to thermal shock.

Insist on WIRE GLASS *for Glazing*

. . . in skylights, windows, partitions, doors and wherever else fire or breakage protection is needed.

Send for free catalog 58-I. Address Department 13.

MISSISSIPPI GLASS COMPANY

88 Angelica St. • St. Louis 7, Missouri

NEW YORK • CHICAGO • FULLERTON, CALIFORNIA

For more facts circle 589 on Reply Card

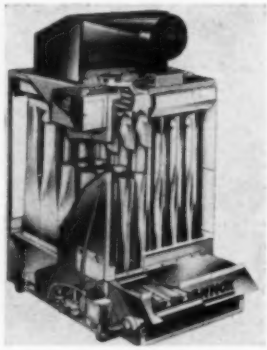
NEW PRODUCTS

(Begins on page 140)

thorough inspection. Enclosures are readily removed, and replaced, and require no alignment. The protruding conduit box is eliminated. Noise mufflers, air filters and other accessories can be added without redesign of basic parts. Standardization is possible because each F/A Motor frame size replaces 16 of the previous line. Westinghouse Electric Corp.

24—GAS DUCT HEATER is compact in use, flexible

Input capacities of the GSDI Heater range from 120,000 to 420,000 Btuh. The units are fired with natural, mixed, manufactured or L-P gas. The GSD1 can be installed in existing ducts to



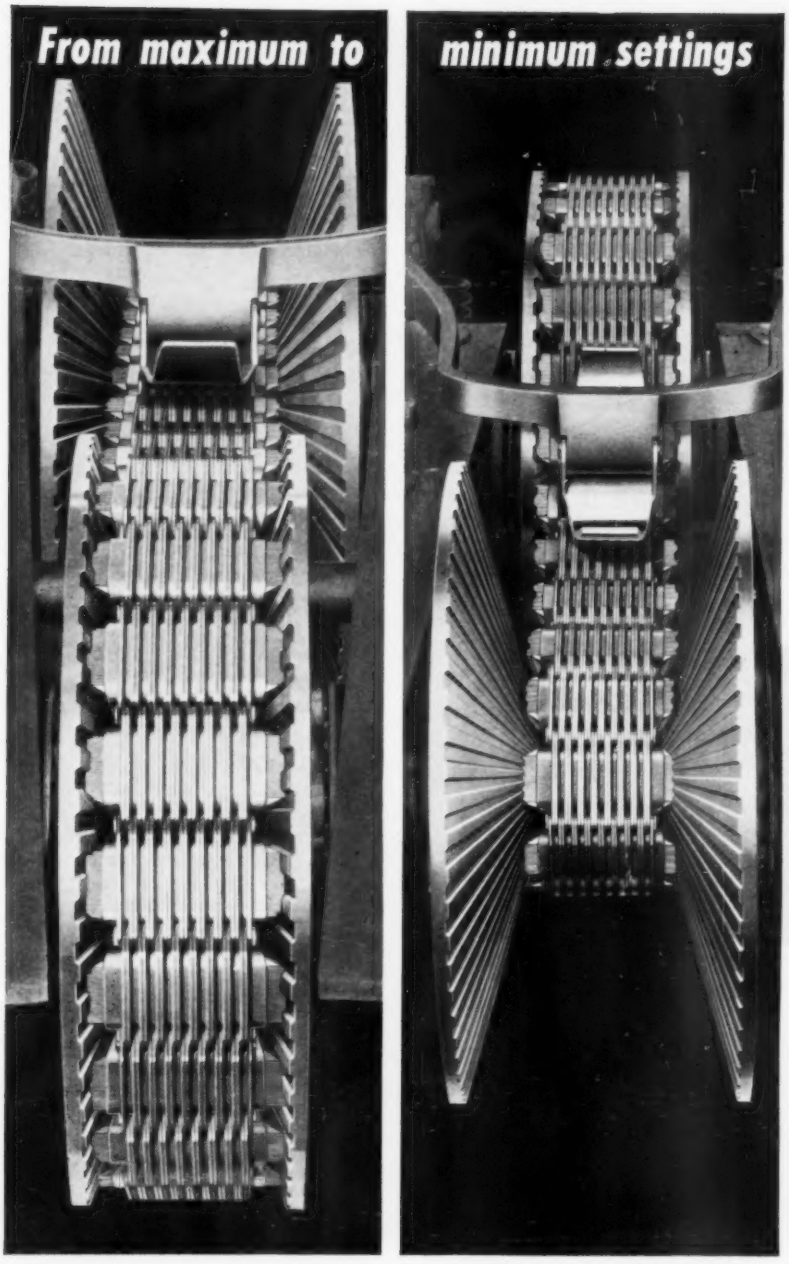
boost the heating capacity of an existing system if a separate duct or air supply is available, or mounted in groups with a large single blower and duct to supply the air. In such an installation, separate ducts can be run off from each individual duct heater to the desired areas, providing zone-controlled heating, thermostatically regulated for each separate zone. Outstanding features of this heater are a gray-enameled heavy steel cabinet; short flue gas diverter for close-to-ceiling installation; heat exchanger with individual aluminized steel sections for maximum heating efficiency; two limit controls for safe operation with air entering either end of the heater. Lennox Industries Inc.

25—LIQUID LEVEL CONTROL is pneumatically actuated

This system consists of company's Varidrive motor equipped with a pneumatic Varitrol actuator. The Varidrive, receiving a signal from a level controller, automatically provides variable speed to the pump to maintain a constant level within the tank. The system is announced as entirely pneumatic and containing no floats or

For positive, accurate speed control

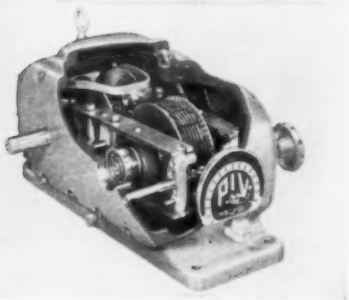
...there's nothing like P.I.V.



VARIABLE from top speed to minimum speed with no steps, no stops in between. That's Link-Belt P.I.V.—the *only* chain-driven variable speed drive. Teeth—not tension—permit instant ratio changes with no loss of speed, regardless of load conditions.

Slippage? Not a chance—P.I.V.'s chain-to-wheel grip is positive as a gear. In fact, this is industry's most accurate, most reliable mechanical variable speed drive.

Your Link-Belt office or authorized stock-carrying distributor has Book 2274 on P.I.V. drives from ½ to 25 hp. Refer to the yellow pages of your local phone directory under Power Transmission Equipment.

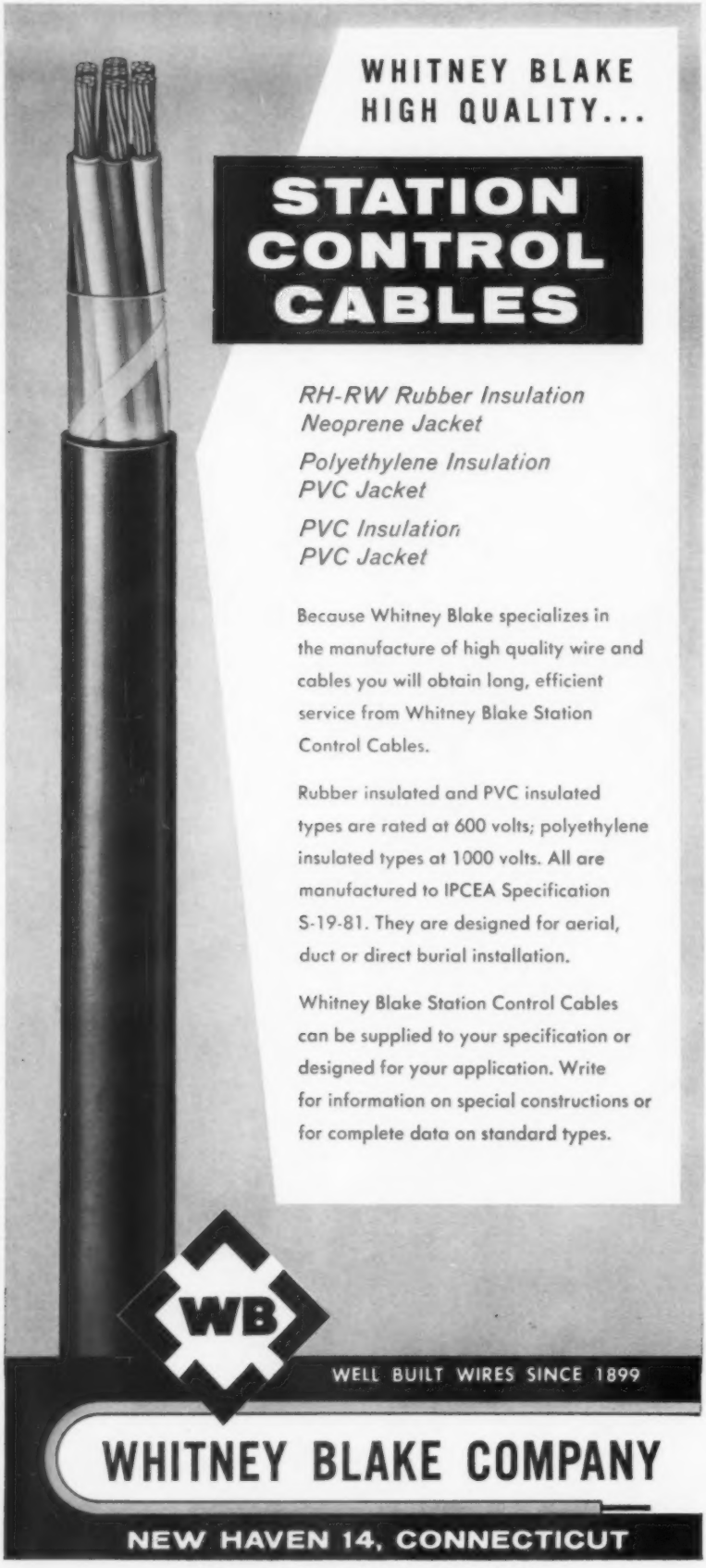


HOW P.I.V. WORKS. Exclusive self-tooth-forming chain of P.I.V. consists of packs of free-sliding steel slats which serve as teeth. Chain grips beveled grooves on pairs of conical wheels located on input and output shafts. Speeds are changed by varying the effective diameters of the wheels, as shown at left.

P.I.V. LINK-BELT
VARIABLE SPEED DRIVE

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants, Sales Offices, Stock Carrying Factory Branch Stores and Distributors in All Principal Cities. Export Office: New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14.813

For more facts circle 590 on Reply Card


WHITNEY BLAKE
HIGH QUALITY...
STATION
CONTROL
CABLES
RH-RW Rubber Insulation
Neoprene Jacket
Polyethylene Insulation
PVC Jacket
PVC Insulation
PVC Jacket
Because Whitney Blake specializes in the manufacture of high quality wire and cables you will obtain long, efficient service from Whitney Blake Station Control Cables.
Rubber insulated and PVC insulated types are rated at 600 volts; polyethylene insulated types at 1000 volts. All are manufactured to IPCEA Specification S-19-81. They are designed for aerial, duct or direct burial installation.
Whitney Blake Station Control Cables can be supplied to your specification or designed for your application. Write for information on special constructions or for complete data on standard types.
WB
WELL BUILT WIRES SINCE 1899
WHITNEY BLAKE COMPANY
NEW HAVEN 14, CONNECTICUT
For more facts circle 591 on Reply Card

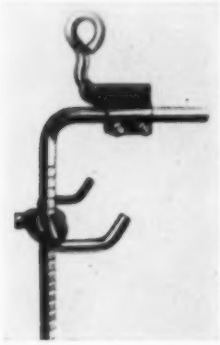
NEW PRODUCTS

(Begins on page 140)

flow restricting valves. There are two methods by which liquid level may be controlled in an open tank—air purge and liquid purge. The former, using a bubbler tube, is for use with water and other uniform liquids of low viscosity. The liquid purge method, using a trickle flow of purge liquid, is for higher viscosity liquids. More information is in Bulletins F-1952 and F-1882. U. S. Electrical Motors Inc.

26—HANGER carries work loads of any size

The Hex-Lok Conveyor Hanger is an adjustable, self-balancing, reusable hanger made up from such parts as stem clamps, hexagon-shaped stems, crossbars, hooks, trays, and a multitude of prongs, racks, forks and other



work-holding attachments. These interchangeable parts are adjustable to carry work loads of any size or shape, company says, and are easily clamped in place with a locking device. Interlocking hexagon shapes are designed to prevent slippage or rotational movement. The conveyor carrier is suggested for short run lots, or in operations which frequently change. Conner Steel Products.

27—AIR FILTER offers installation, storage benefits

Model B Roll-O-Matic, an automatic renewable-media air filter, is shipped in small cartons, none weighing over 175 lb. Its modular design greatly reduces installation time, permits easier storage on the job site and does not require rigging for installation. A feature announced for the Model B is stronger media, reinforced for greater strength and incorporating an adhesive which will not "run" in high temperatures, thicken in low temperatures or lose its adhesive qualities due to dryness. Also listed as advantages by manufacturer are galvanized

MASONITE
Makes the News

®Masonite Corporation—manufacturer of quality panel products.

Ever-smooth gravity chutes help costs go down, too!

You can really let things slide—speedily and smoothly—when you build chutes and conveyors with versatile Masonite panels.

Many other materials-handling, maintenance and safety problems are well solved by these tough, grainless panels. They're easy to fabricate and fasten...will take plenty of punishment. See your building materials dealer and send the coupon for a very helpful booklet about Masonite® hardboard panels in factory maintenance.

MASONITE® Panel Products

MASONITE CORPORATION
Dept. PE-8, Box 777, Chicago 90, Ill.

Please send me your booklet on factory methods with Masonite panels.

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Zone.....*County*.....

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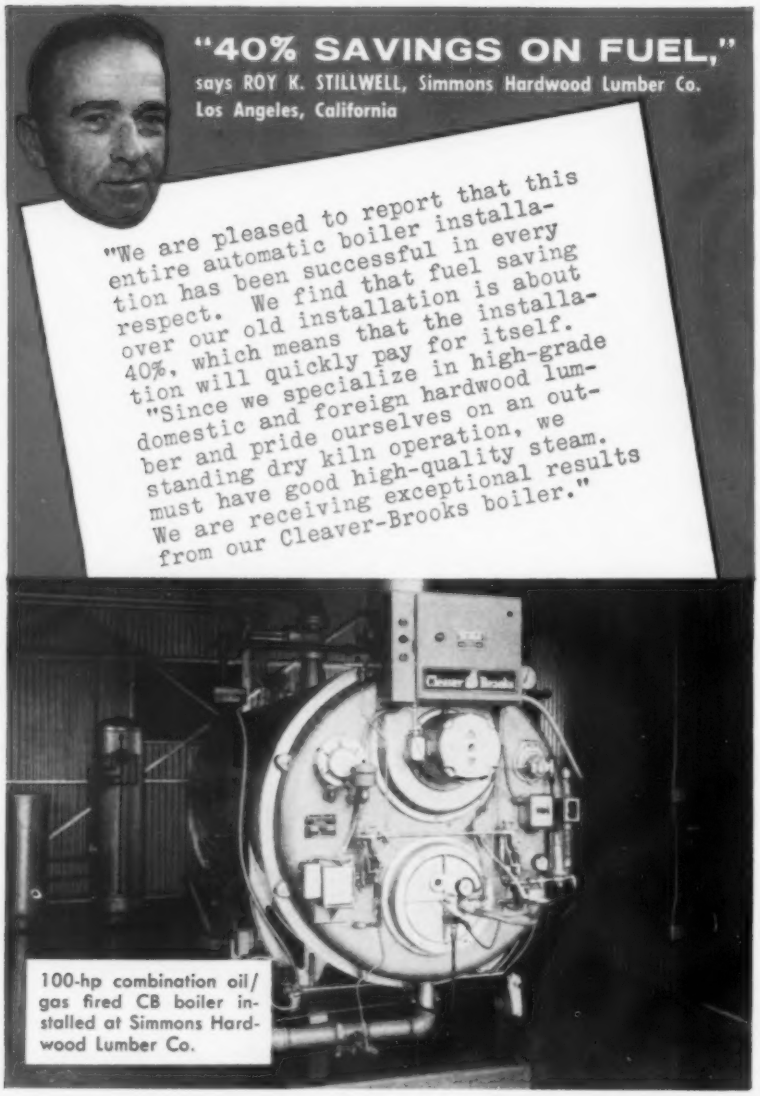

"40% SAVINGS ON FUEL,"
says ROY K. STILLWELL, Simmons Hardwood Lumber Co.
Los Angeles, California
"We are pleased to report that this entire automatic boiler installation has been successful in every respect. We find that fuel saving over our old installation is about 40%, which means that the installation will quickly pay for itself.
"Since we specialize in high-grade domestic and foreign hardwood lumber and pride ourselves on an outstanding dry kiln operation, we must have good high-quality steam. We are receiving exceptional results from our Cleaver-Brooks boiler."
100-hp combination oil/gas fired CB boiler installed at Simmons Hardwood Lumber Co.

For process steam economy . . .

Install a packaged CB boiler

CB boiler four-pass design with forced draft is the most efficient combination to transmit heat to boiler water. Forced draft blower provides correct amount of air for complete combustion, eliminates the need or cost of a high, expensive chimney. Combustion gases are forced at high velocity through the four passes, literally scrubbing heat from the flame. Result: lower fuel costs.

Five square feet of heating surface per boiler hp is another reason why CB boilers give you longer service life with less maintenance. Every CB boiler is guaranteed to operate at a minimum efficiency of 80%.

Each Cleaver-Brooks self-contained boiler is a complete package. Fully factory tested, it's ready for installation, service connections and operation. No make-ready delays . . . no extra parts needed.

A trained technician starts your CB boiler, adjusts it for your specific needs, and trains your attendant in care and maintenance.

Available in 19 sizes, 130 models, 15 to 600 hp — steam or hot water, gas, oil, or combination oil/gas fired.

For more facts on the self-contained CB boiler, contact your dealer or write: Cleaver-Brooks Company, Dept. J, 364 E. Keefe Ave., Milwaukee 12, Wisconsin.

Cleaver Brooks®

ORIGINATORS OF SELF-CONTAINED BOILERS

For more facts circle 593 on Reply Card

NEW PRODUCTS

(Begins on page 140)

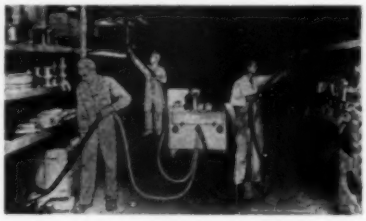
construction to minimize corrosion problems, improved media supports, an improved drive on the service side of the unit which will serve as many as six units, and an average of 12-months' supply of filtering media in a 65-ft roll. The filter comes in vertical sections of 3-, 4- and 5-ft widths, in heights from 5 to 15 ft. American Air Filter Co., Inc.

28—ACID HOSE designed for highly corrosive services

Commander Acid Hose contains a hose tube made of a new acid-resisting material, according to manufacturer, and this tube withstands 96 per cent sulfuric acid at 70 F as well as strong oxidizing acids and other chemicals. The hose is available in two constructions for discharge and suction service. A tough, resilient cover protects against scuffing. The hose comes with straight ends or enlarged ends, capped or "cut off." B. F. Goodrich Industrial Products Co.

29—POWER SWEEPER has vacuum hose attachment

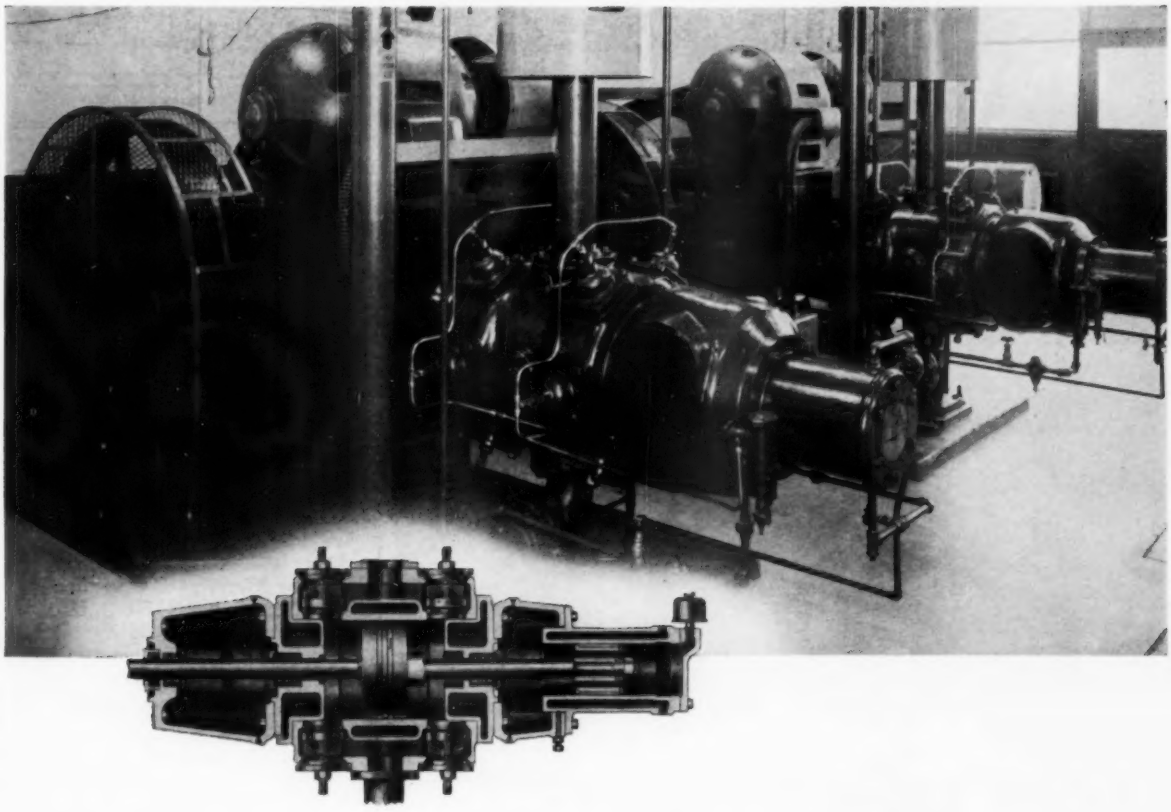
This improved power sweeper combines a vacuum hose attachment to clean shelves, bins, under machinery



and in tight places as an operational accessory. The unit is mounted on the sweeper and utilizes the vacuum system of the mechanical sweeper. Debris is disposed of into the sweeper's large-capacity hopper. Wayne Mfg. Co.

30—STEAM GENERATOR has "membrane wall" design

This oil and/or gas fired, pressurized-furnace steam generator is designed for power, process or heating loads requiring steam capacities up to 400,000 lb per hr. The boiler offers "membrane wall" prefabricated furnace construction, which utilizes welded tubular furnace wall panels. According to company, high efficiency and elimination of induced draft fan are accomplished through pressurized-furnace design, with a subsequent savings in fuel, fan and power costs. Boiler



*with PENNSYLVANIA tailrod construction,

COMPRESSORS PROVIDE GUARANTEED OIL-FREE AIR

Protect your processing and instrumentation from the effects of oil or oily vapors in compressed air or gas with Pennsylvania Class 3-ATC tailrod compressors. These compressors are designed specifically for this service—not ordinary "oil-less" compressors adapted from conventional units.

Customers have found that the Pennsylvania 3-ATC provides long life and unsurpassed performance in installations where even the slightest amount of lubricant or oily vapor would interfere with delicate instruments, contaminate food and beverages or be incompatible with chemical processes. A typical user comment on tailrod compressors: "Machines have been in operation almost 19 years . . . we would consider maintenance to be entirely nominal."

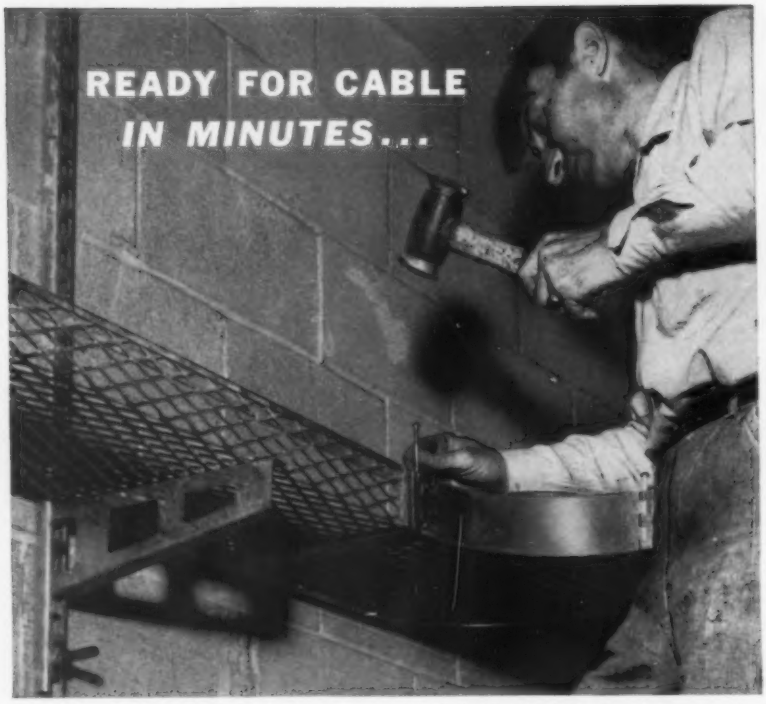
Full details of the 3-ATC Compressor, which uses the Air Cushion Valve, noted for its simplicity of design and dependability in service, can be found in Bulletin 202. Write for your copy today.

***With PENNSYLVANIA tailrod construction** a full floating piston greatly prolongs the life of carbon piston rings and eliminates the danger of scoring cylinder walls. An extra long distance piece between cylinder and frame assures that no part of the piston rod which enters the lubricated frame will enter the cylinder stuffing box. Result: a compressor which will deliver air or gas guaranteed 100% free of oil or oily vapors due to lubricants.

PENNSYLVANIA PUMP AND COMPRESSOR CO.

Easton, Pa. • Earning customer confidence since 1920

For more facts circle 594 on Reply Card



An aluminum coupler plate and two steel pins do the job—with Cope's patented pin-type coupler.

Cope cable trough cuts labor costs to a fraction!

Three simple parts—an aluminum coupler plate and two steel pins—are all it takes to connect complete sections of Cope cable *trough* . . . and in less than half the time required to connect two lengths of conduit. Furthermore, because each 24″ width of trough supports as much cable as *sixteen* lengths of 4″ conduit, you can sometimes actually reduce labor time *and costs* by almost 60% for the complete job!

Space Saving Flexibility. Design and construction features of lightweight, easy-to-handle Cope cable supporting equipment speed installation of space saving systems—even in the most cramped quarters.

A complete line of system accessories and fittings allow for necessary changes in direction or elevation. Supporting riser elbows, trough to box connectors, and drop outs provide maximum flexibility of installation to meet system requirements . . . reduce design time up to 25% for laying out your system.

Cut Costs Three Ways. You save *three ways* when you specify Cope cable supporting systems with pin-type coupler . . . trough, ladder, or channel.

- **LOWER FIRST COST**
- **LOWER INSTALLATION COSTS**
- **LOWER SYSTEM MAINTENANCE COSTS**

Discuss these advantages for *your* installation with a qualified Cope representative—or write to T. J. Cope Division, Rome Cable Corporation, Collegeville, Pa.

T. J. COPE *Division*
ROME CABLE CORPORATION

For more facts circle 595 on Reply Card

NEW PRODUCTS

(Begins on page 140)

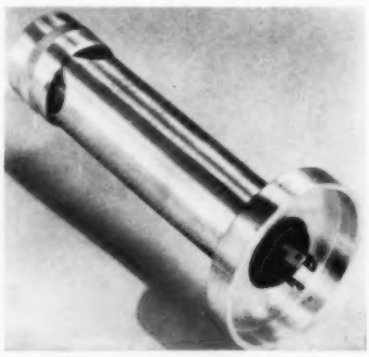
operation is said to be simplified because there is only one fan. Designated the PFI (Power For Industry) Boiler, the unit is available for steam pressures up to 1150 psi and for superheated steam temperatures to 900 F. It is designed for burning either oil or gas or a combination. Stand-by fuel* is instantly available with the dual-fuel burner, since one fuel can be lighted from the other, manufacturer notes, and this avoids either a boiler outage or a drop in steam pressure when fuels are changed. The Babcock & Wilcox Co.

It's easy to obtain product data with the postage-free Reader Service Cards provided on pages 171-172. Use them for information on advertised products, too. Just circle the key number appearing at bottom of the ad.

31—CONTROL UNIT turns the lights on and off

Floodlight Control 3158, with a photoelectric cell highly sensitive to light and darkness, is designed to automatically turn on floodlights, street lights, warning lights and sign lights when darkness approaches, regardless of the hour—and turn them off when daylight comes or illumination isn't needed. One model can control 2000 w of fluorescent or neon lights, or 1000 w of incandescent lights, it is announced; by using a power contactor it can control a bank of lights with an unlimited load. The three-contact twist-lock plug-in base makes it easy to install. Bases with pig-tail connections also available.

The photo-electric cell in the control is adjustable to respond to various light levels between ½ to 100 ft-c of daylight by turning the screw cap



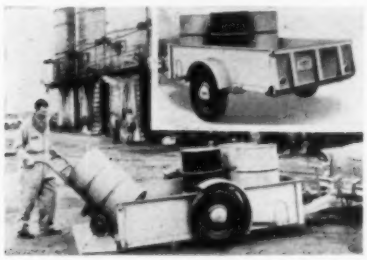
down. The light-level scale on the control permits setting of several controls in different areas to operate at a predetermined light level. The control can be installed at up to a 30-deg angle, can withstand considerable vibration, and is not affected by temperature changes, it is noted. Roth Mfg. Co.

32—CENTRIFUGAL PUMPS for handling corrosives

This series of stainless steel centrifugal pumps is introduced for pumping corrosive materials in virtually all process industries. Incorporated are such operating and maintenance features as volute type pump head for maximum conversion of velocity to pressure energy, Francis-type impeller for efficient, non-clogging operation, and spacer type coupling for ready removal of rotary assembly without disturbing piping or electrical connections in base. Available in a full range of sizes and seal styles, pumps include models to operate at —80 to 400 F. Tri-Clover Div., Ladish Co.

33—ELEVATING TRAILER lifts its load fast

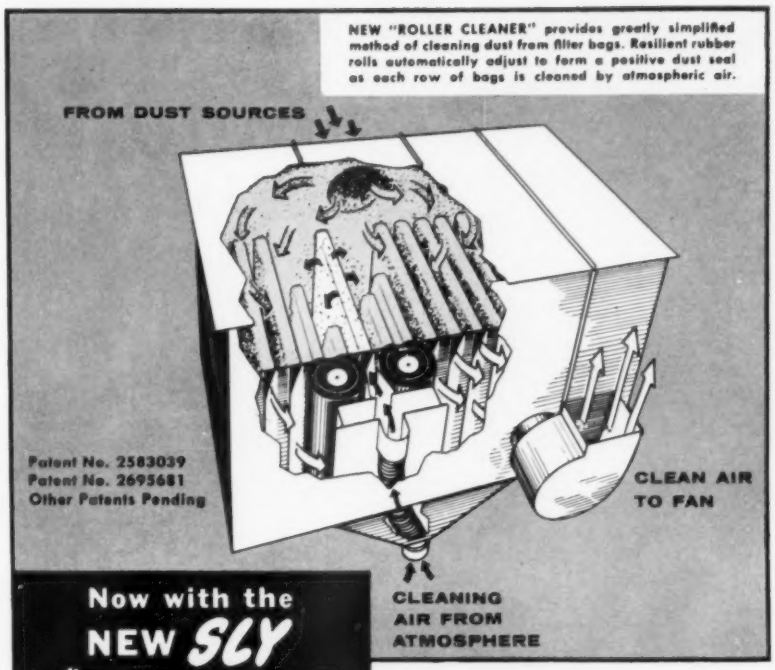
Trailevator is an elevating trailer for all-purpose cargo handling, designed to lift its own load in 40 sec. The unit has a hydraulically operated bed which lowers to receive load at ground level,



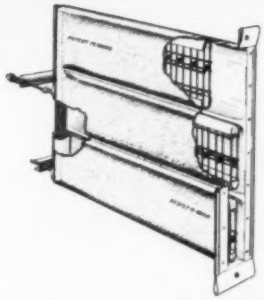
then lifts and locks into hauling position. Features announced include: load leveling device to compensate for non-uniform load distribution; independent wheel suspension and dual leaf type springs, and a tailgate which forms a heavy-duty loading ramp as well as secure box closure. According to manufacturer, this trailer need not be detached from towing vehicle for loading or unloading; the bed will hold for loading at any level from ground to hauling position. Of all-steel construction, the unit is rated at 2000-lb capacity, weighs only 960 lb. Magline Inc.

34—FLOWMETER measures flow in either direction

The Mighty-I is designed to measure flow in either direction and in any pipe size from 1½ to 8 in. without additional components or accessories.


NEW "ROLLER CLEANER" provides greatly simplified method of cleaning dust from filter bags. Resilient rubber rolls automatically adjust to form a positive dust seal as each row of bags is cleaned by atmospheric air.
FROM DUST SOURCES
Patent No. 2583039
Patent No. 2695681
Other Patents Pending
CLEAN AIR TO FAN
CLEANING AIR FROM ATMOSPHERE

Now with the NEW SLY "ROLL-CLEAN" DYNACLONE



As much as 3 TIMES LONGER BAG LIFE

NEW SLY "RESIST-O-WEAR" FILTER BAGS (patent pending) provide complete dust filtration with as much as three times longer life than conventional bags. This has been proved on the toughest field installations.

The new bag has three equal-size sections. Each pocket has two spacers, making a total of six per bag. Weight is distributed on three seams rather than one, minimizing strain. A special protective flap on the back end prevents abrasion from incoming dust.

Now standard in the new "Roll-Clean" Dynaclone, Sly "Resist-O-Wear" bags combine with all the other superior Dynaclone features to assure greatest dust collecting efficiency with unequalled maintenance-free service.

ALL THESE FEATURES IN ONE DUST FILTER

- New "Resist-O-Wear" bags last as much as three times longer.
- Constant suction at dust sources—complete dust collection.
- Automatically self-cleaning for continuous operation.
- Free-rolling cleaner. Complete dust seal—automatic seal adjustment.
- Greater filtering capacity; smaller space requirements.
- Simplified construction for ease of inspection and servicing.

SEND FOR New Bulletin 105 and New 36-page Dust Control Catalog 104.

SINCE 1876 SLY

THE W. W. SLY MANUFACTURING CO.

4600 TRAIN AVENUE • CLEVELAND 1, OHIO
OFFICES IN PRINCIPAL CITIES

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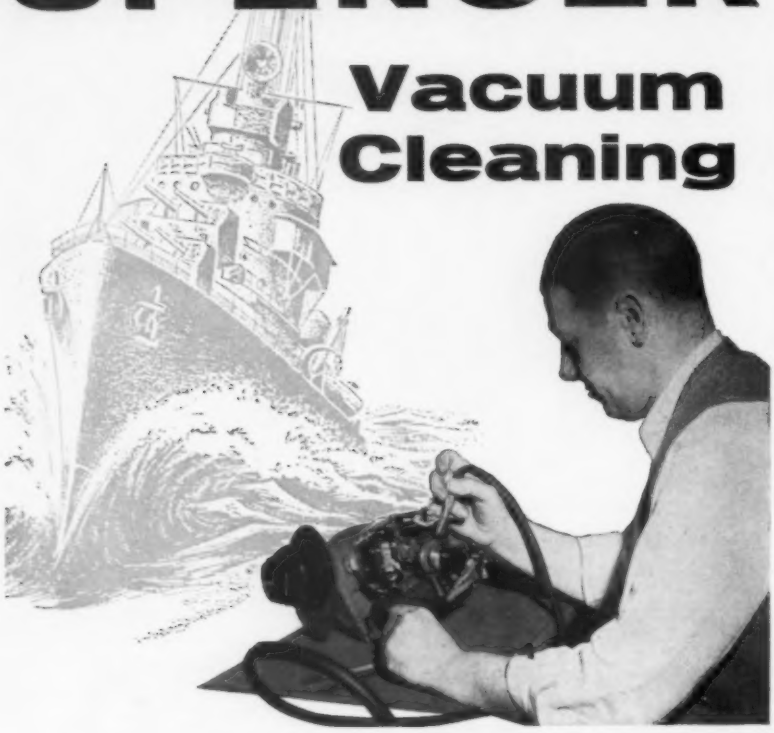
SPENCER

Vacuum Cleaning



Navy Gunsight Computer being cleaned by Spencer vacuum at Sperry Gyroscope Co., Great Neck, New York.

. . . guards Quality at SPERRY

A SPENCER central vacuum cleaning system, piped to work stations in final assembly areas, permits quick, thorough removal of any dust or foreign matter.

Whatever *your* need in a vacuum cleaning system —for protection of your product or general plant maintenance—it will pay to check with SPENCER.

REQUEST CATALOG NO. 155-B
FOR COMPLETE SPECIFICATIONS

The SPENCER TURBINE COMPANY
HARTFORD 6, CONNECTICUT

OTHER QUALITY SPENCER PRODUCTS

BLOWERS

PORTABLE VACUUM CLEANERS

PNEUMATIC CONVEYING SYSTEMS

For more facts circle 597 on Reply Card

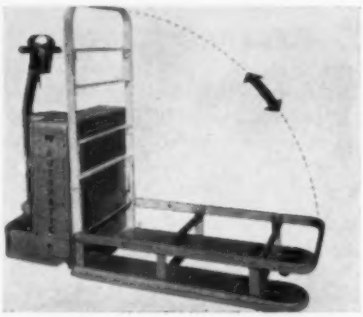
NEW PRODUCTS

(Begins on page 140)

This corrosion-resistant flowmeter requires no flanges or matching orifice plates and can be installed in minutes, according to manufacturer. Although designed primarily for swimming pool filter operation, the Mighty-I is declared suitable for other services with flow ranges up to 10 to 1. Readings are made directly by means of a ball float and a linear scale calibrated in gallons per minute. Scales covering flow rates 3-30 to 200-2000 gpm available. Fischer & Porter Co.

35—SKID ADAPTER for use on low lift trucks

This manufacturer's Transporters, operator-led low lift trucks, can be twice as versatile equipped with an auxiliary platform. This accessory can be folded back and held upright so the truck can move pallets, or the platform can be lowered over the pallet forks



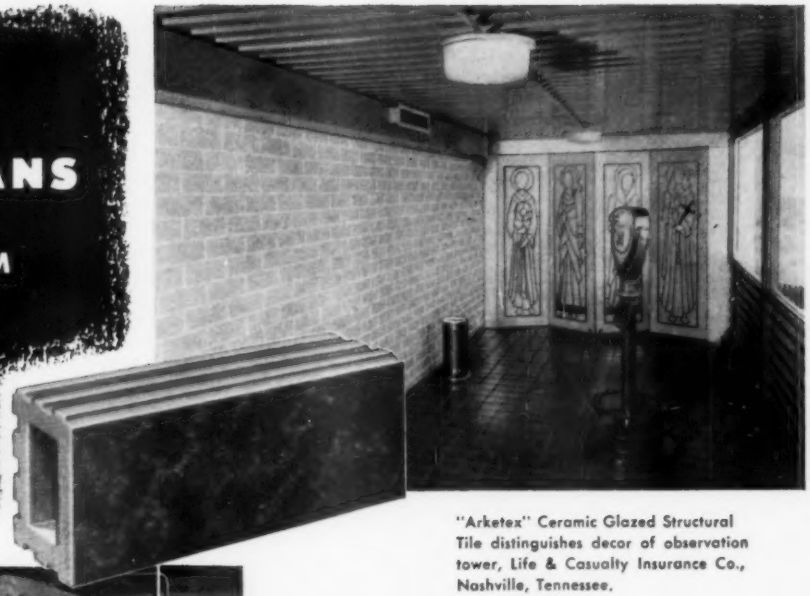
and thereby converted into a platform or skid handler. The skid adapter comes in lowered heights of 6 to 11 in. to suit underclearance of skids. Width of truck's forks determine width of adapter. The same is true of length, although the superstructure can be made longer than forks if necessary. The skid adapter is made of ½-in. wide by 2-in. deep structural steel bars of rectangular section. Its two connecting cross members lie flat when the rack is in horizontal position and pivot into line when raised vertically. Automatic Transportation Co.

36—IMPROVED ELECTRODE works easier, faster

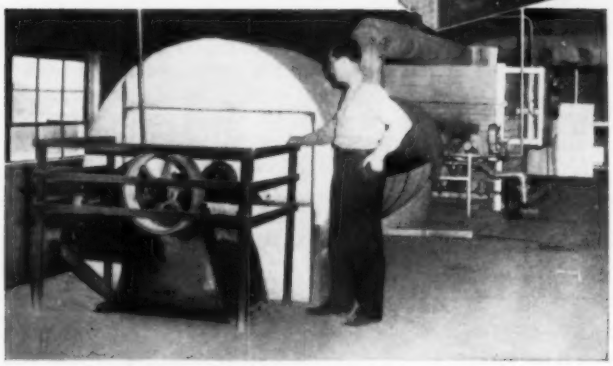
Fleetweld 7MP is announced as a new E-6012 electrode introduced to reduce costs of general production and maintenance welding. Manufacturer says the design of its coating, which includes addition of iron powder, makes this electrode easier to operate and faster than previous E-6012 designs. It is classed as an all-position a-c and d-c, mild steel electrode. Inclusion of

HOW Bayley FANS

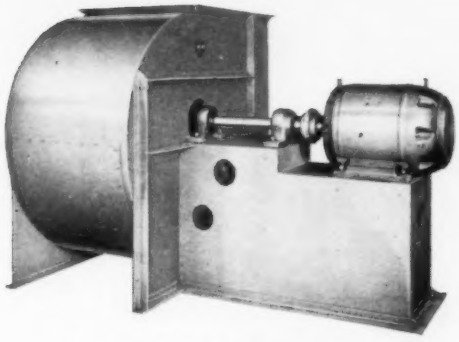
RECIRCULATE WARM AIR FOR DRYING Arketex CERAMIC GLAZED STRUCTURAL TILE



"Arketex" Ceramic Glazed Structural Tile distinguishes decor of observation tower, Life & Casualty Insurance Co., Nashville, Tennessee.



Bayley Fans recirculate warm air for clay products dryers in plant of Arketex Ceramic Corp.



Bayley 445 Fan similar to type employed in "Arketex" ceramics plant.

IN the progressive-type dryer required for drying the high quality ceramic glazed structural tile produced by the makers of "Arketex," it is essential to properly control both temperature and humidity. A battery of six Bayley Fans are employed in the modern plant of Arketex Ceramic Corporation, Brazil, Indiana, for re-circulating warm air in clay products drier.

Choice of Bayley Fans for this process at "Arketex" is a reflection of confidence on the part of both dryer designer and the purchaser in the efficiency of Bayley equipment. You may always rely upon Bayley specialists to recommend the right answer to your air-handling requirements.

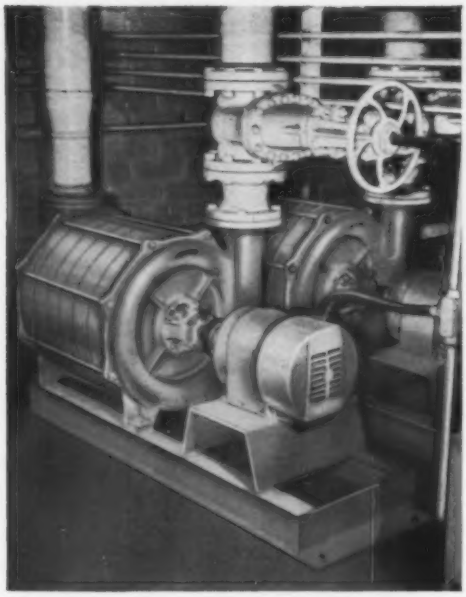
Illustrated Bulletins upon request.

Bayley BLOWER COMPANY

1825 South 66th Street — Milwaukee, Wisconsin

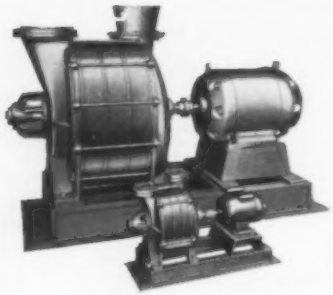
For more facts circle 598 on Reply Card

FOR LOW PRESSURE AIR REQUIREMENTS . . .

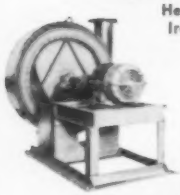


use a low air pressure source

LAMSON BLOWERS



Heavy Duty Cast Iron, Models M and C



Heavy Duty Fabricated, Model B and Model HR, with V-Belt Drive

It doesn't pay to operate a costly high pressure air system with reducing valves for low pressure air. For low pressure air requirements, use Lamson Blowers. You get air at the right pressure for the job—you don't pay for pressure you don't use!

Lamson Blowers deliver clean, dry air or gas—without pulsation. Pressure always remains nearly constant at all capacities, with HP proportional to actual volume delivered. Don't compress, then decompress! Use the right pressure from the start!

Send for free booklet: *"The Right Pressure for the Job!"* Pictures and diagrams show how Lamson Blowers save you money. It illustrates both cast iron and fabricated models.

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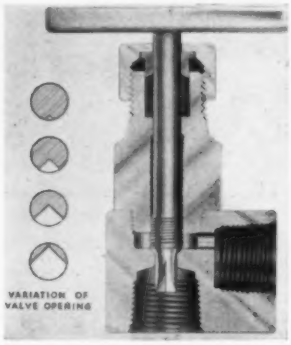
NEW PRODUCTS

(Begins on page 140)

a moderate amount of iron powder and certain arc stabilizing ingredients to the coating produces an electrode said to combine ease of operation, good bead appearance and a-c operation of an E-6013 electrode with the higher speeds and lower cost of an E-6012 electrode. Advantages cited include: excellent operation on a-c, even with low, open circuit voltage machines; increased deposition rate and electrode "mileage"; reduced spatter; easy slag removal, and good operation at low currents to minimize burn-through on sheet metal. Fleetweld 7MP costs the same as company's other E-6012 electrodes. The Lincoln Electric Co.

37—BAR STOCK VALVE for improved flow control

The Veegroo Tapered Orifice Valve is designed to eliminate clogging problems. By moving a plug with a tapered slot into and out of a circular opening, the flow of fluid or gas is controlled by the area of the slot at the



head of the opening. This bar stock valve comes in standard sizes to 1 in., with pressure ratings 3000 and 10,000 psi. Materials available include carbon steel, three stainless steels, Monel, aluminum, and Alloy 20. Manufacturer says this valve will pass foreign particles up to 25 times larger than comparable needle valves. While its function is basically that of a needle valve, by concentrating all of the flow area in one triangular section, instead of around an annular ring, it is claimed virtually clog proof. General-American Valve Co.

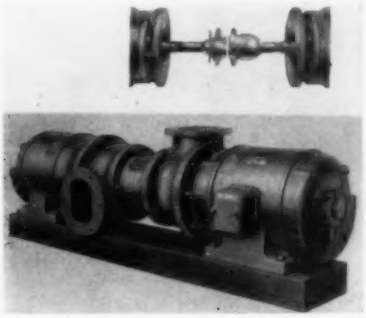
38—DRIVE TOOL puts fastenings into masonry

With the versatile T-25H Drive Tool, fastenings of almost every description can be made directly into concrete, masonry, brick, composition blocks and even steel, without pre-drilling, plugging or explosives, it is announced.

Model T-25H has been engineered for installation of narrow channels, such as Wiremold. Of hardened nickel-steel alloy with steel drive ram and molded safety hand grip, the tool is operated in four simple steps and saves over 50 per cent installation time against previous type fastening, company states. The made-to-match conic fasteners are rust-proofed and come in pins, studs, also drive-ring fasteners in lengths up to 4 in. Hilti Rapid Fastening Systems, Inc.

39—PUMP, counter-rotating, for problem fluids

This counter-rotating pump is claimed to handle chemical slurries, soaps, pulps, sand and water, pastes, and viscous materials in a wide range of densities, with solid particles in suspension, at low and high temperatures and at high flow rates and pressures, without separation of mixtures. Efficiency of the compact pump is attributed to the method of counter-rotation

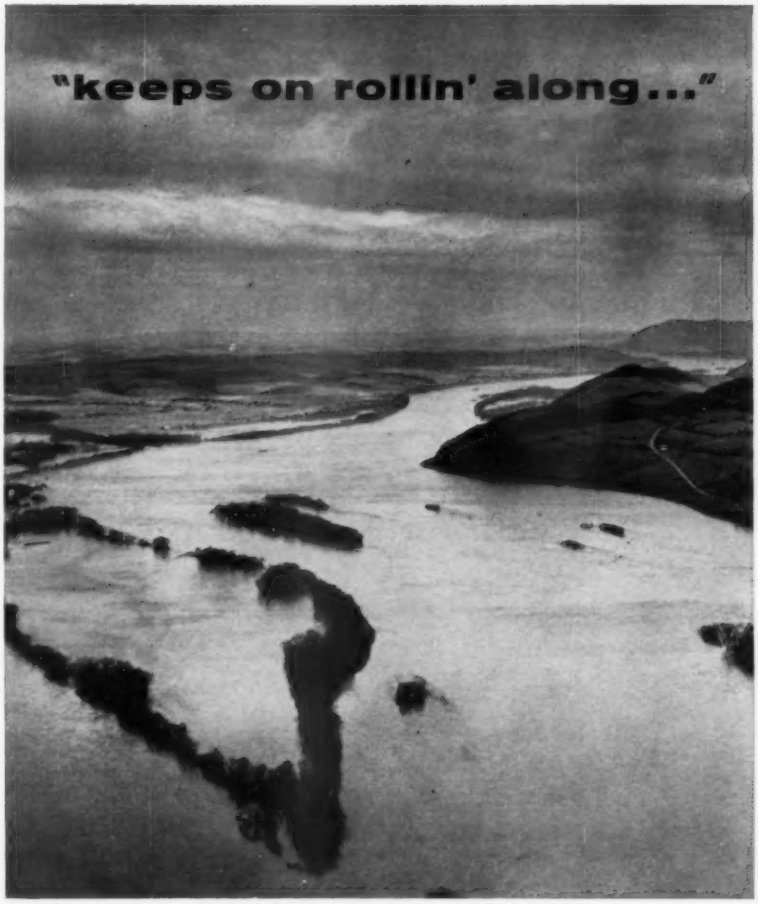


supplied by two small-diameter impellers. These axial impellers, of double-Venturi design, counter-rotating at relatively high velocities, allow passage of coarse materials.

Body of the Model 120, shown, is only 14 in. long without motors, and has an outside diameter of 9½ in. Manufacturer says that with two 4.7-in. diam impellers, a 5-in. suction and 5-in. discharge, it will pump as much as 500 gpm, requiring only 12½ input horsepower. The Baez Counter-Rotating Pump Corp.

40—CAR MOVER travels anywhere in the yard

For shunting railroad cars in and out of sidings, the ILO Single-Wheel Car Shunter is announced as a single-cylinder unit which can be operated by one man, yet is capable of moving any car up to 100 tons at normal walking speeds. Already in use in Europe, this car shunter is suggested for use wherever cost of a switch engine is not justified or where cable pullers do not satisfy needs for versatility. An advantage is its ability to travel any-



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(Begins on page 140)

where in the yard — on or off the tracks. The large rubber tire has gripper teeth to pull the shunter over rail points, switches, sleepers and ties. Car engagement is provided by a high ratio jack screw and clamp. Three dial-selected forward speeds are available. Carriage swivels 90 deg in either direction so the shunter can get in between coupled cars, and so the operator can walk adjacent to tracks for safe visibility. The shunter follows the rail automatically, it is pointed out; the operator is required to control only the throttle. The unit weighs 550 lb. Rockwell Mfg. Co.

41—VENTILATOR-SKYLIGHT of plastic and steel

The Conso Roof Ventilator is a lightweight plastic and steel unit that also illuminates the interior of a building. A feature is its Fiberglas-reinforced polyester plastic hood. This translucent dome passes about two-thirds of the outside light. It is described as shatterproof and resistant to atmospheric and chemical corrosion. Because

of its light weight (reported 50 per cent less than those of comparable all-steel units) the Conso is easily handled and installed, and it does not require extra supporting members or special reinforcing in either new or existing structures, company states.

The ventilator fan, sheathed by a galvanized housing, is powered by a heavy-duty electric motor with automatic thermal overload cut-off switch. The units come in 18 sizes, fitted with fans measuring 24 to 48 in. in diameter. Plastic hoods range from 45 to 80½ in. square. Consolidated General Products, Inc.

Use the Reader Service Cards provided on pages 171-172 to ask for more information on these products. Circle item numbers of products in which you are interested.

42—LIQUID PLASTIC to protect machinery, metals

Peel-It Weatherguard is a liquid plastic applied by spraying, brushing or dipping on any non-porous material such as machinery, tools, dies, metal stocks. The dry film produced is described as a non-flammable, moisture barrier which protects against corrosive effects of chemicals and chemical fumes, extreme weather conditions in outside storage and abrasion. Manufacturer says the protected object can be restored to use without further cleaning or preparation by simply stripping or peeling off the plastic coating, and there is no oily residue or contamination. Field tests are reported to show this coating lasts up to 3 yr, depending on thickness. Harco Chemical Co.

43—31-IN. HIGH BATTERY offers extra capacity

Type HD Battery is 31 in. high and features 145 amp-hr plates. Newest addition to company's Slyver-Clad line, this is said to provide the highest capacity available in batteries of this height. In producing it, manufacturer

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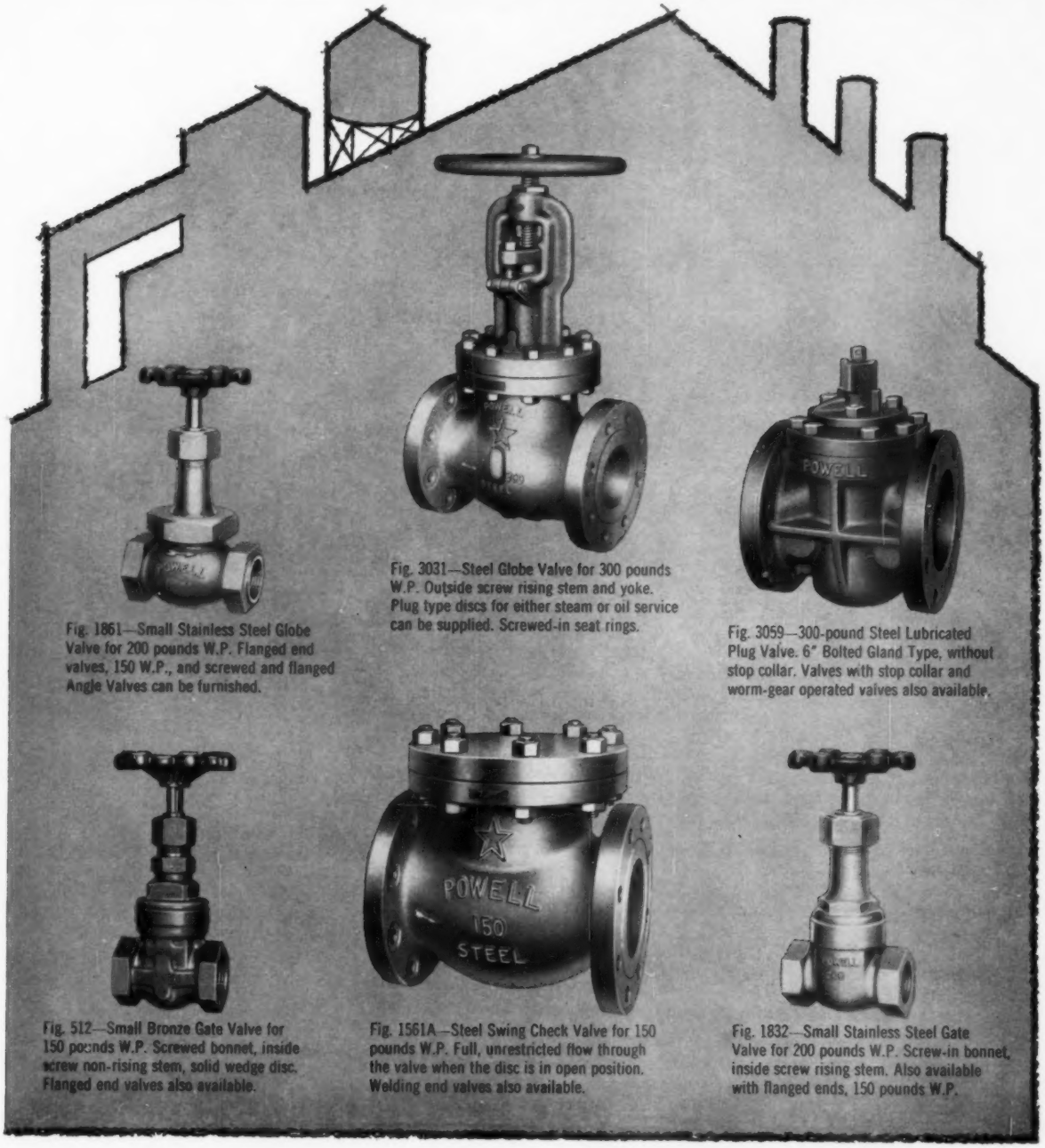

Fig. 1861—Small Stainless Steel Globe Valve for 200 pounds W.P. Flanged end valves, 150 W.P., and screwed and flanged Angle Valves can be furnished.

Fig. 3031—Steel Globe Valve for 300 pounds W.P. Outside screw rising stem and yoke. Plug type discs for either steam or oil service can be supplied. Screwed-in seat rings.

Fig. 3059—300-pound Steel Lubricated Plug Valve. 6" Bolted Gland Type, without stop collar. Valves with stop collar and worm-gear operated valves also available.

Fig. 512—Small Bronze Gate Valve for 150 pounds W.P. Screwed bonnet, inside screw non-rising stem, solid wedge disc. Flanged end valves also available.

Fig. 1561A—Steel Swing Check Valve for 150 pounds W.P. Full, unrestricted flow through the valve when the disc is in open position. Welding end valves also available.

Fig. 1832—Small Stainless Steel Gate Valve for 200 pounds W.P. Screw-in bonnet, inside screw rising stem. Also available with flanged ends, 150 pounds W.P.

For every flow control problem Powell offers more kinds or types, available in the largest variety of metals and alloys to handle every flow control requirement. Powell distributors are located in all principal cities and maintain inventories to fill almost any need. For special engineering problems, write direct to:

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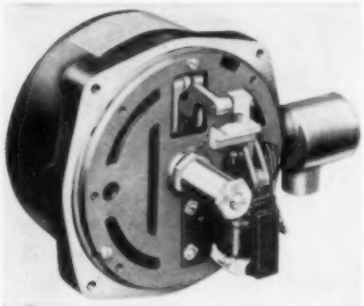
NEW PRODUCTS

(Begins on page 140)

has provided the extra capacity in the battery tray size that previously held cells with 100 amp-hr plates. Because of this, trucks in the 4000-lb range and up using a 31-in. battery can be equipped with the extra capacity battery. Its development is attributed to improvement on basic principle of insulation and retention. This construction method eliminates "shedding" of plates as a determining factor in battery life and reduces space required for sediment. By filling the space thus saved, in cells having industry standard dimensions, with longer and thicker plates, higher capacity is achieved. C & D Batteries, Inc.

44—BRAKE designed for use in hazardous areas

Style UH76A-9 is announced as a magnetic disc brake with a maximum torque rating of 105 lb-ft, Underwriters' approved for use in Class I Group D locations—atmospheres con-



taining gasoline, petroleum, naphtha, propane, natural gas and similar vapors. It is suitable for mounting on the NEMA C flange of motor frames 213 through 256U. By use of an adapter, mounting on 284U and 286U motor frames is possible. It is offered for floor or motor mounting, horizontal or vertical mounting, a-c only. Manufacturer's "unitizing" construction, in which all operating parts are mounted on a common plate, is also incorporated. Stearns Electric Corp.

45—ROOF COATING of pigmented aluminum

Asbestolite M-44 is claimed to have greater roof coverage characteristics, give longer lasting protection, improve building appearance, cut under-roof temperatures, and improve air conditioning efficiency. Tests are reported to indicate that Asbestolite M-44 performs equally well on felt, tar paper, gravel, or composition roofs—pitched or flat. On metal roofs it

serves to prevent rust and stop corrosion. It is formulated from asphalt and waterproofing oils, long Canadian asbestos fibers and metallic aluminum flakes. Manufacturer says it withstands extremes of heat or cold, resists sunlight, weathering, acid and alkali atmospheres, adheres to roof surfaces, is unaffected by expansion and contraction, and does not blister.

When the coating is applied, its aluminum flakes rise to the surface and leaf as the coating sets to form a reflecting insulating "shield" which is bonded to the roof surface. By turning back much of the sun's heat, this coating keeps buildings cooler in summer, and its insulating features serve to stop condensation due to variations between in-building and roof-top temperatures. The Monroe Co.

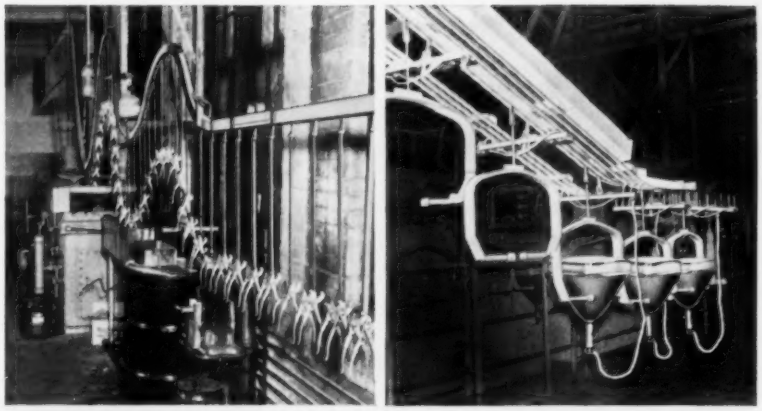
46—METAL PARTITIONS are modular, free standing

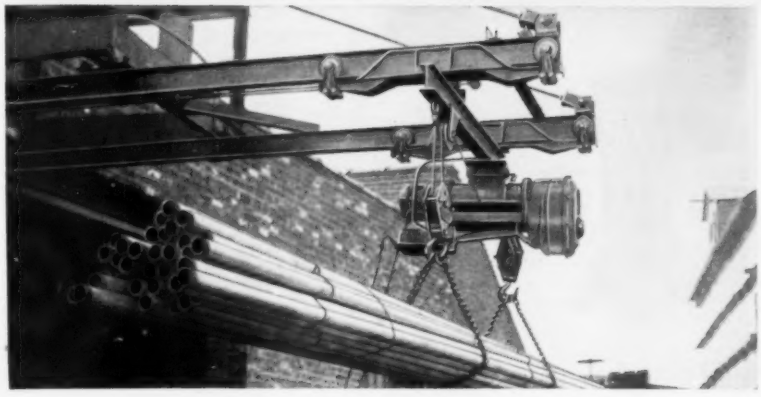
Mainliner Partitions offer an economical means of providing easily changeable semi-private or private space control. A design feature is complete interchangeability of partition sections

and accessories. Only tool required for assembly is a screwdriver. Available in four panel heights from 42 to 84 in., and in several widths from 12 to 66 in., the partitions can be supplied in six colors. Each panel is a 1½-in. thick unit insulated with a honeycomb core for rigidity. A concealed leveling foot permits a 2-in. adjustment for uneven floors and provides a friction-lock with the floor. Partitions over 42 in. high can be furnished with glass or acoustical panels. The Mills Co.

47—PLASTIC ENVELOPE has non-fray sealed edges

This vinyl plastic shop envelope has electronically sealed edges. They won't fray or tear, it is stated, and the plastic is so tough that a sharp metal part will neither tear nor scratch it. Job tickets or parts cards may be read through the translucent material which will also accept writing by pencil or ball point pen. Forbes Products Corp.





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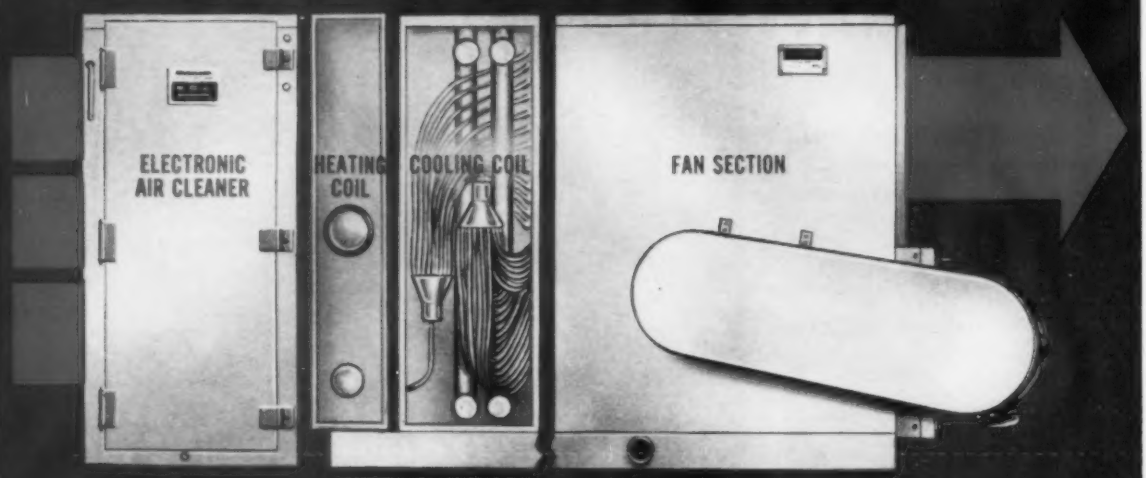

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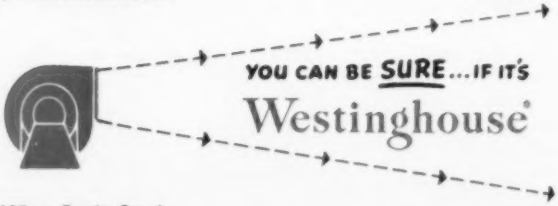

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BULLETINS

(Begins on page 21)

146 Metal-Cutting Machinery—This 20-pp catalog describes automated special machine tools for low, medium and high-production operations. Divides special metalworking machine tools into specific generic types and outlines production parts, operations and rate schedules to which they are applicable. High production automation concepts, including building block principles. Snyder Tool & Engineering Co.

147 Automatic Lathe—Basic information on the Simplimatic automatic lathe using a large horizontal table upon which tools can be placed to best advantage is presented in 22-pp Form 1159-C. In addition to illustrated details on the unit and its components, bulletin also gives specifications and a floor diagram. Gisholt Machine Co.

148 Polygon Tool—Production possibilities of the Polygon Tool Box which can provide hexagon, octagon, square or other shapes from round stock, drilled and finished in one operation, are described in this 20-pp booklet. Operations are illustrated, instructions for use detailed, and capacity and dimensional data tabulated. Bradley Machinery Sales Co., Inc.

HEATING

149 For Better Heating—This 21-by-24 in. wall chart is designed to promote better unit heating. Includes both unit heater maintenance tips and performance check list. Modine Mfg. Co.

150 Instantaneous Heaters—Eight-pp Bulletin IW-34 features detailed information on indirect type instantaneous water heaters, their application, selection and installation. Method of estimating hot water demand is detailed and example problems included. Typical instantaneous heater installations are diagrammed and selection tables given. Bell & Gossett Co.

151 Repair or Replace? — Bulletin 158-B discusses economics of steam and hot water unit heater replacement. Why unit heaters fail, relative costs of repairing or replacing, and benefits of a replacement program as related to plant operation and maintenance are subjects covered. Modine Mfg. Co.

CONSTRUCTION

153 Buildings In Color — Complete details on the development of pre-engineered steel buildings in color, using a vinyl-aluminum protective coating, is contained in a recently published brochure. A handy color guide is included. Stran-Steel Corp.

154 Steel Joists — Bulletin 3011 is an illustrated 25-pp manual on construction with Electro-Channel open-web steel joists for underfloor electrification. Shows through photos and diagrams how underfloor electrification can be achieved at low cost. Describes joist construction, typical installations. Ceco Steel Products Corp.

155 Framing Anchors — Design information on Trip-L-Grip framing anchors is presented in this 8-pp bulletin. Contains tables of recommended safe working values and maximum joist spans, and applications for efficient joining of 2-by-4 to 2-by-12 in. members in wood construction. Sixteen popular applications are illustrated. Timber Engineering Co.

156 Acoustical Tile — Application specifications for a fissured, non-combustible mineral wool acoustical tile are presented in this illustrated data sheet. Lists materials, directions and specifications for three common methods of acoustical tile installation: adhesive, concealed suspension and exposed suspension. Line drawings show detail of each installation. Acoustical Products Div., Baldwin-Hill Co.

FANS, VENTILATING AND AIR CONDITIONING

157 Mechanical Draft Fans — Catalog 1321 describes efficiency and quietness of airfoil blading for full range applications in three product lines: combustion air forced and induced draft; primary air for pulverized fuel injection; and high-pressure air supply for cyclone furnace boilers. Illustrated with photos, catalog includes general engineering data. Sturtevant Div., Westinghouse Electric Corp.

158 Putting Air To Work—Booklet D-5199, 32 pp, covers treatment and distribution of air and products available for the job. The well-illustrated booklet has sections on air handling, air conditioning, air heating, and electronic air cleaning. Also included are descriptions of applications in these categories as well as descriptions of the applicable products, together with pertinent application data. Sturtevant Div., Westinghouse Electric Corp.

160 Air Conditioning Units—Bulletin 786 contains 54 pp of information and selection data on air conditioners, including capacities, standard arrangements, dimensions, etc. Steps in selection of basic unit and components are outlined, and how various components may be selected to build up a unit to meet job requirements is discussed. First pages are devoted to choosing the physical size based on air capacity and face velocity requirements, while succeeding pages concern themselves with heating and cooling requirements, temperature control, etc. American Air Filter Co., Inc.

161 Duct Silencers — Bulletin Q-30R1, 10 pp, covers Quiet-Duct silencers for air conditioning and ventilating systems. Data is also included on the methods used in selecting silencers. Industrial Acoustics Co., Inc.

BOILERS, GENERATORS

162 Automatic Heating Boiler—Described in this 8-pp bulletin are boilers designed specifically for hot water heating applications to overcome difficulties encountered in two basic distribution systems — continuous heat delivery at varying rates of heat flow or intermittent heat delivery at fixed rate of heat. York-Shipley, Inc.

163 Water Tube Package — Featured in this 20-pp bulletin are a package two-drum water walled steam generator for oil-gas-coal and a two-drum factory built or field erected steam generator for any firing method. Design and construction features are detailed and engineering data tabulated. Erie City Iron Works.

INSTRUMENTS, CONTROLS

164 For Metering—Two especially accurate and economical meters, Propeloflo for liquids and Shuntflo for air, steam or gases are the subject of 6-pp Bulletin 100-R1. Provides photos, line drawings, cutaway views and technical data tables to supplement the explanatory text. Builders-Providence, Inc., Div. B-I-F Industries, Inc.

165 Bellows Flow Meter — Specification S-292-2 describes construction and operation features of company's bellows meter for flow and liquid level applications. Included is cutaway view showing component features, as well as specification data. Minneapolis-Honeywell Regulator Co.

166 Gravimetric Feeders — Simplex or duplex gravimetric feeders for liquids or solids are described in 8-pp Bulletin 32-R2. Provides explanatory text, dimensional drawings and tables, photos, schematic drawings and performance charts. Omega Machine Co. Div., B-I-F Industries, Inc.

167 Valve Actuator—Catalog V-200 describes an automatic valve actuating conversion unit designed for converting hand-operated valves to automatic operation. Advantages are detailed and a drawing showing design features included, also maximum pressure differential chart. C. H. Wheeler Mfg. Co.

On the facing pages 171-172 are postage-free Reader Service Cards provided for your convenience in ordering these bulletins. You may also use the cards to order any literature mentioned in ads.

168 Liquid Level Controls — This 16-pp catalog describes a system of liquid level control which operates without floats and with no moving parts in the liquid. Liquid level relays, electrodes, signals, alarms, and alternators are covered, and charts and diagrams of typical applications included. B/W Controller Corp.

169 Bin Level Indicators—This 20-pp catalog features three products for bulk material, level indication and control. Includes illustrations, outline dimensions, specifications, and applications for the Bin-Dicator, diaphragm type bin level indicator; Roto-Bin-Dicator, rotating paddle type bin level indicator; and Bin-Flo Aerator, to promote flow of dry, finely ground bulk materials. The Bin-Dicator Co.

170 Thermocouple Assemblies — Twelve-pp Section E describes heavy

BULLETINS

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duty industrial thermocouple assemblies. Each component in the thermocouple assembly is individually described, and selection data, photos and dimensional diagrams are included. Thermo Electric Co., Inc.

PUMPS, COMPRESSORS

173 Centrifugal Fire Pumps—Horizontal single stage, horizontal multistage and vertical turbine multi-stage fire pumps are covered in illustrated, 32-pp Bulletin B-1500. Featuring complete descriptions and dimensions on horizontal centrifugal pumps and the vertical turbine multi-stage types, bulletin contains data pertinent to selection, application and installation of fire pumps. Peerless Pump Div., Food Machinery and Chemical Corp.

174 Compressors, Gas Turbines—Composite Catalog 151, 40 pp, features company's standard products, highlighting latest engineering and performance data with reference to petroleum, refining, chemical, petro-chemical and other industrial applications. Detailed specifications and diagrams of gas-engine-driven, steam-engine-driven and electric-motor-driven compressors are included. Unit characteristics and application suggestions are also discussed. Clark Bros. Co.

PAINTING

176 Painting Program—This 12-pp booklet reveals how a planned industrial painting program can slash maintenance costs. Reviews comparative painting costs in the process industries. Describes firm's program involving comparison of paint performance in field tests, survey of plant painting procedure, educational and training courses for maintenance personnel, and preparation of painting standards and specifications for individual plants. Kenneth Tator Associates.

177 How to Strip Paint—Four methods commonly used to remove paint are described in detail in this 8-pp bulletin. Twelve paint stripping compounds — alkaline, solvent, and solvent-acid—each designed to remove different type paints are covered. Oakite Products, Inc.

178 Color Conditioning—How to put the power of color to work profitably is explained in this 28-pp color conditioning booklet. Tells how color conditioning boosts production, improves morale and promotes safety, and includes some full-color photos to illustrate "before-and-after" situations in typical plants. E. I. du Pont de Nemours & Co., Inc.

TUBING, FITTINGS

179 Tubular Products—Testing and inspection methods used during manufacture of company's line of seamless and welded carbon, alloy and stainless steel tubular products are described in 24-pp Bulletin TB-420. Explains how these techniques are integrated into manufacturing. Tubular Products Div., The Babcock & Wilcox Co.

180 Hydraulic, Fittings—Catalog 556, 288 pp, is devoted to hydraulic tube fittings. Catalog is divided into three sections—covering self-flaring fittings, no-flare fittings and flare-type fittings. Each section contains information on the design and installation of the type covered plus detailed dimensional and engineering specifications. Flodar Corp.

OTHER EQUIPMENT

181 Hot Spray Process—This 28-pp booklet explains theory of hot spray process and features case histories of the results obtained with hot spray in metalworking and furniture manufacturing plants, and in maintenance and fabrication. A question-and-answer section provides technical material on advantages, possibilities of hot spray. The Spee-Flo Co.

182 For Production Control—How a production control system enables extension of automation benefits to general manufacturing systems is explained in this 8-pp brochure. Through this system, every piece of productive machinery in a plant is linked electrically to a central monitoring room where visual displays and recorded data give minute-by-minute information on machine operation and progress of work. Control Systems Co., Div. Hancock Industries, Inc.

183 Thread Compound—Featured in this informative bulletin is company's high temperature thread compound designed to eliminate seizing and galling of threads, and resulting breakage of studs, bolts and flanges. Typical uses are detailed. Felt Products Mfg. Co.

184 Stainless Steel Wire—Information on use of stainless steel wire, its mechanical properties, and corrosion data are included in this 20-pp manual. Also contains tables listing round wire weights, conversion of fractions to decimals and millimeters, and analyses of various types of stainless steels. Jones & Laughlin Steel Corp.

185 Data Control System—A step-by-step explanation of the Filmsort system for engineering drawings is presented in this illustrated 16-pp brochure. Traces basic procedures in transforming an original engineering drawing to a frame of microfilm; inserting film into an aperture card; viewing and enlarging film from card and use of electrostatic and dry-copy printing. The Filmsort Co.

186 Aluminum Fabricating—This 14-pp booklet pictorially describes engineering services and metalworking tools available in company's jobbing facilities. Depicts company's diversified skills and equipment for designing, forming, joining and finishing aluminum jobbing products. Included are action photos of several operations. Aluminum Co. of America.

187 Cemented Carbide Products—Catalog VR-58 is an 88-pp plastic-bound reference on products for the user of cutting tools. Fully indexed, catalog contains an explanation of grade recommendations for machining all materials now in use by the metalworking industry. This grade chart covers 14 grades of cemented carbide now available and gives their physical properties. Vascoloy-Ramet Corp.

188 Adhesives, Coatings, Sealers—Specifications for a wide variety of adhesives, coatings and sealers are listed in 26-pp Catalog No. 8. Catalog lists, in numerical form, Military, Army and Federal specifications, their definitions, and the corresponding 3M adhesive, coating or sealer meeting specifications. Minnesota Mining and Mfg. Co.

189 Plastics Catalog—This 74-pp plastics catalog and technical manual gives detailed information on characteristics and service applications of a variety of plastics materials in the form of sheets, rods, tubes, balls, liquid and film. Among plastics covered are acrylics, acetate, fiber glass panels, fluorocarbons, mylar, nylon, polyethylene, polystyrene, phenolic, Teflon and vinyls. Auburn Plastic Engineering.

190 For Colorful Storage—Six new decorator colors now offered in company's steel storage equipment are illustrated in Color Guide SF-8. Actual paint samples of the new colors as well as three standard colors, are included. Penco Metal Products Div., Alan Wood Steel Co.

191 Pneumatic Products—Twenty-pp Catalog 616 features air line filters, regulators, and lubricators. Includes complete engineering and operational data, performance characteristics, "quick sizing" charts and specifications. Watts Regulator Co.

192 Latches, Hinges, Gasketing—A complete line of latches, hinges, and gasketing material for the sheet metal industry is featured in this 12-pp bulletin. Presented are access door hardware, access doors and damper hardware. Ventfabrics, Inc.

193 Belt Cleaner—Comprehensive technical data, specifications and illustrations are featured in Bulletin 258 on company's spring type conveyor belt cleaner. How to protect and extend belt life is detailed. Stephens-Adamson Mfg. Co.

194 Foam Control—Bulletin HSP-905 describes company's antifoams used to control foaming and carryover in steam boilers, eliminate unscheduled outages, cut maintenance, simplify control, minimize blowdown and make-up, and disperse sludge. Case histories are detailed. Hagan Chemicals & Controls, Inc.

195 Rubber Products—Comprehensive information on industrial rubber products used by the manufacturing, petroleum, processing and other industries is presented in this 72-pp Catalog. It describes and illustrates various types of hose, conveyor belting, packing, plastic pipe, garden hose and couplings. Information on applications, product construction and lengths available is included, along with specifications. Acme Rubber Mfg. Co.

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K-1. CAPTIVE STUD KIT—designed to prevent free flight of studs when base material is inadequate. Used with "Power-Mate," this is safest Stud Driver ever designed.

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DATA FILE of literature for the plant engineer's library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these catalogs, circle item numbers of those wanted on postage-free cards provided for you on pages 171-172.

HEATING, COOLING AND AIR CONDITIONING

301 Unit Heaters — Catalog 157, 32 pp, contains performance and application data on company's line of unit heaters, including design and construction details, dimension diagrams, and tabulated information on steam capacities, conversion factors, hot water capacities, performance factors, and heat transfer coefficients. Modine Mfg. Co.

302 Electric Heating Units—Catalog 50, 50 pp, contains complete engineering data on electrical heating units and equipment, including strip elements, finstrip elements, tabular elements, cartridge elements, ring elements, immersion heaters, circulation heaters, radiant heaters, forced air duct heaters, unit heaters, hot plates and others. Includes photos, dimensional drawings, prices, standard rating tables, and specifications. Edwin L. Wiegand Co.

303 Plumbing, Heating Supplies—Edition H is the current edition of this company's 126-pp general catalog on plumbing and heating repair parts, tools and accessories. Indexed and illustrated, the catalog gives detailed information on sizes, intended uses. J. A. Sexauer Mfg. Co., Inc.

304 Stainless Steel Heaters — Complete description and specifications on stainless steel direct-fired heaters are included in 6-pp Bulletin F-57A-RO. Cutaway views, drawings and diagrams illustrating design and construction features are included. Reznor Mfg. Co.

305 Heating and Ventilating—Company's "comfort curtain" principle of heating and ventilating is described in this 8-pp bulletin. Advantages are detailed and typical installations pictured through drawings and photos. Dimensions and specifications are included. Lennox Industries Inc.

306 Fresh Air Supply — Bulletin FAS-1, 24 pp, describes horizontal and vertical discharge unit heaters for replacing process exhausted air with warmed fresh air and for comfort ventilation. Dimensions, capacities, and suggested methods of installation are given, and photos, drawings and diagrams included. L. J. Wing Mfg. Co.

307 Liquid Cooler—Described in 12-pp Bulletin HB-755 is company's Hydro-Flo package liquid cooler, a water chilling unit for space cooling systems, combination heating and cooling systems and industrial processing applications. Design features are covered in detail. Flow diagrams show use of this cooler in various systems. Bell & Gossett Co.

308 Air Conditioner — Advantages and applications of company's air conditioner, designed to give precise control of air temperature and moisture, are detailed in 8-pp Bulletin 122. A cutaway diagram shows component features. Niagara Blower Co.

PACKINGS, SEALS

309 Piston Packing—Sixteen-pp Bulletin 5503 presents engineering data on Darcova Pumcups for packing pistons of air cylinders, hydraulic cylinders and reciprocating pumps. Included are operating diagrams and a list of typical installations, as well as helpful data on Pumcup compositions, textures and types made available for specified pressure and other corrosive conditions. Darling Valve & Mfg. Co.

311 Rotary Seal Data — Plant engineers concerned with process equipment will find it easy to select the right type of mechanical seal for a specific operating condition with Form 480, a 16-pp, catalog on rotary mechanical seals. It is extensively illustrated with cutaway views showing stuffing box installation details. Durametallic Corp.

PUMPS, COMPRESSORS

313 Sewage Pumps—Twelve-pp Bulletin 7500 illustrates heavy-duty wet and dry pit sewage pumps, small vertical sewage pumps and standard and submersible cellar drainers. Includes performance tables for selecting pumps, dimensional drawings and details of construction. The Deming Co.

314 Liquid Ring Pump — Bulletin 725.6 describes light weight, self-priming, portable or permanent liquid ring pump for transfer and similar jobs, which handles air alone, liquid alone or any air-liquid combination. Specifications, performance and construction data are included. Gould's Pumps, Inc.

315 Solids Handling—Bulletin 121-A, 8 pp, describes non-clog pumps for handling solids in suspension. Included are vertical, horizontal and close-coupled types used to handle liquid components of industrial processes, industrial waste, and for such pumping applications as water supply, drainage and sewage handling. Aurora Pump Div., The New York Air Brake Co.

316 For Abusive Pumping Jobs — Catalog 4906, 36 pp, covers centrifugal pumps for wide industrial use and especially adapted to handling ashes, abrasive mixtures, slurries, hot and corrosive liquids. It describes several basic types; a horizontal shaft, single-stage side suction pump; a horizontal shaft, single-stage, rear-entrance automatic priming pump; vertical shaft pumps with standard, overhead and quill bearings. Nagle Pumps, Inc.

318 Blowers and Pumps—Blowers, gas pumps and vacuum pumps are described and illustrated in 8-pp Bulletin S-59F. Text covers characteristics of operation, construction, and types of drive. Also provided are details on relief valves, timing gears and thrust bearing assembly. Standard blower dimensions are charted as are performance examples for low, medium and high pressure blowers. Sutorbilt Corp.

319 Liquid Ring Pump — Bulletin 725.6 describes a self-priming liquid ring pump for transfer and similar applications designed to handle air alone, liquid alone or any combination of air and liquid. Specifications, performance curves and construction data are included. Goulds Pumps, Inc.

320 Horizontal Compressors—Eight-pp Bulletin HAC-40 describes company's Class RX horizontal, single-stage air compressors. Keyed cutaway illustrations show design and construction features. Lubrication, controls available and standard equipment are covered. Gardner-Denver Co.

321 Air Compression for Industry—This is a 24-pp combination data book and catalog on all types of air compressors from ⅓ hp to 20 hp. Discusses factors to be considered in the use of air for each operation, and points out importance of determining how much usuable air is needed. The Wayne Pump Co.

322 Industrial Air Compressors — Advantages of company's line of industrial air compressors are detailed in 16-pp Catalog 5510. Tables indicating weights, code words and dimensions are included, as well as cutaway views showing design and operation details. Compressor specifications are given, and dimensional diagrams and other material included. Schramm, Inc.

LUBRICATION

323 Lubricant Data Book—Sixteen-pp Lubriplate Data Book offers practical information on lubrication of machinery. Gives product data on grease type and fluid products, hydraulic oil, compressor oil, motor oil. Suggestions on applying lubricants under various conditions given. Lubriplate Div., Fiske Bros. Refining Co.

324 For Better Lubrication—Advantages of company's lubricants which are specially compounded for lubrication of reduction gear drives are outlined in pocket-sized folder. Features which assure smooth, trouble-free gear drive performance and lower maintenance costs are listed. Gulf Oil Corp.

325 Industrial Greases — Described in Technical Bulletin 50 are a group of greases suitable for all types of industrial applications at temperatures from zero to 300 F, in wet, moist or dry surroundings. Sun Oil Co.

TOOLS, MACHINE SHOP

326 Where to Use Your Stud Driver —Twenty-pp pocket-size Form 955 describes and pictures applications of studs, using company's Model 450 stud driver. Provides some operating hints and safety precautions and covers use of studs through steel into concrete, wood into concrete, wood into steel

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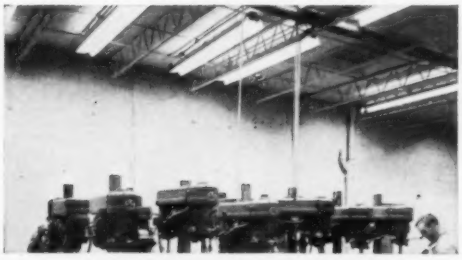

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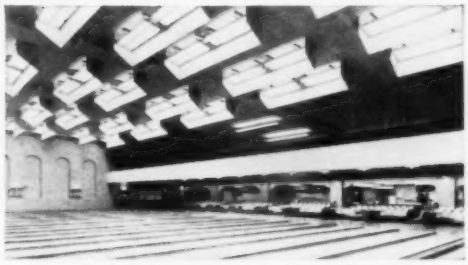

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DATA FILE

(Begins on page 176)

and steel into steel, as well as their use in attaching pre-drilled fixtures. Remington Arms Co., Inc.

327 Portable Electric Tools—This standard catalog, Form 10, 24-pp, features portable electric tools, including electric drills, bench-drill stands, hole saws, buffing and polishing kits, sanders, polishers, grinders, hammers, etc. The Black & Decker Mfg. Co.

329 Handy Fastening Tool — Two booklets show different ways in which this fastening tool can be used. One booklet shows how the tool can be used for plant maintenance—fastening conduits, bus ducts, junction and outlet boxes, surface raceways, fixtures and frames, duct straps, fan and blower mounts, etc. The second booklet indicates the correct fastening and charge to use to fasten materials of varying thickness to concrete or steel. Ramset Div., Olin Mathieson Chemical Corp.

330 Pipe Tools—Ordering and application information on Ridgid pipe tools is provided in 16-pp illustrated Catalog 7596R6. Wrenches, cutters, threaders, reamers, vises, and others are pictured and described, also power drives, pipe and bolt threading machines, oilers. The Ridge Tool Co.

331 Data for the Shop—"Fluids and Facts for Metal Working" is a pocket-size booklet of about 44 pp. A section on metal working fluids covers their function and selection, preparation and use of soluble oils and paste compounds, and prevention of dermatitis. A section on metal working facts gives conversion tables, steel numbering systems, machinability ratings of metals. Standard Oil Co. (Ind.)

ELECTRICAL

333 Immersible Motor — Bulletin 2300 describes applications in which the submerged motor is close-coupled to pumps, agitators and mixers, eliminating long shaft connections, intermediate bearings, couplings and special bases. Cutaway shows engineering features. The Louis Allis Co.

334 Electrical Equipment Digest—Electrical equipment illustrated and described in 154-pp Catalog Digest 140, includes load centers, circuit breakers, low voltage control, fusible service equipment and accessories, meter sockets and troughs, safety switches, panelboards, duct and fittings, starters, other equipment. Square D Co.

336 Conductor Systems—This 36-pp catalog describes the Insul-8-Bar systems of mobile safety electrification for cranes, monorails and moving machinery. Includes photos and descriptions of typical installations, engineering data, installation procedure, a photo-text list of items that comprise these systems. Insul-8-Corp.

337 Varnished-Cambric Cables—Bulletin VC-56-1OM, 22 pp, covers varnished-cambric cables in a voltage range of 600 to 5000 v for single and three conductor cables braided or lead sheathed. Armored cable constructions in both galvanized steel armor and aluminum armor are shown. Rockbestos Products Corp.

339 Architectural Floodlighting — Eight-pp Bulletin GEA-6437 illustrates various methods of floodlighting industrial plants, public and commercial buildings and others. Provides information on general purpose heavy-duty floodlights. General Electric Co.

340 Wires and Cables—Interlocked armored cable, supports and fittings designed for low cost, heavy duty industrial, power or control wiring are described in this 24-pp bulletin. Photos and specific descriptions of various types of armored cables available for voltages through 15,000 v, single and multi-conductor are included. National Electric Products Corp.

341 Flexible Cords—This well illustrated 24-pp booklet includes all new Underwriters classifications for flexible cords manufactured by this company. Featuring data on Dynaprene and rubber jacketed cords as well as braid covered types, also gives tips on selection. Whitney Blake Co.

342 Cable Supports—This information folder contains data on company's cable supporting equipment, telling how to install cable supports, as well as giving advantages of cable trough. T. J. Cope Div., Rome Cable Corp.

343 Fuses for All Uses — This revised edition of manufacturer's complete line, Folder 3, includes illustrations and descriptions of fuses for every purpose. Features dual-element cartridge fuses for time-lag in protection against overloads, and delay renewable fuses and renewal links. Economy Fuse & Mfg. Co.

344 Battery Service Tips — Latest information on industrial batteries on cycle service, including industrial truck units, is provided in the new edition, about 40 pp, of company's industrial battery service manual. Includes photos, charts, tables, repair methods, maintenance, and salient points on operation, instructions covering repairs. C & D Batteries, Inc.

345 Battery Users Manual—Motive-power battery maintenance and repair is detailed in this newly revised edition of company's Battery Users Manual (Bulletin GB-1599A), 44 pp. Developed as a result of in-plant training courses, this book is designed to enable plant engineers to conduct an organized battery training course. Gould-National Batteries, Inc.

347 Enclosed Switches—Catalog 83, 28 pp, and Catalog **101**, 20 pp, describe enclosed switches for industrial uses. Included are general switches designed for use on either a-c or d-c applications, sealed switches, heavy-duty limit switches, hand operated switches, and maintained-contact switches. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

348 Oil-Tight Pushbuttons — Illustrated in full color, 30-pp Publication EL-178 presents company s line of oil tight pushbuttons, indicating lights, selector switches, Roto-Push buttons, covers and enclosures and accessories. All models are pictured along with selection charts, ordering information. Cutler-Hammer, Inc.

349 For Hazardous Locations—Bulletin 2655, 82 pp, featuring Condulets for hazardous locations contains a table listing commercial uses of hazardous substances and their flash points and ignition temperatures. Detailed descriptions of explosion-proof and dust-tight electrical equipment conforming to National Electrical Code are included. Crouse-Hinds Co.

DUST CONTROL

351 For Dust Collection—A collection of product sheets providing application suggestions and specifications on Dustkop equipment designed to solve a wide range of dust handling problems is provided in the Series 700 bulletins. Various models are described and illustrated. Aget Mfg. Co.

353 Industrial Dust Control — Bulletin 104, 36 pp, on company's dust filters, gives detailed information about dust control systems and how to engineer them. Includes description of the Roll-Clean Dynaclone dust filter, as well as information, capacities and dimensions for other Dynaclone and automatic continuous dust filters, intermittent filters, economy filters, etc. The W. W. Sly Mfg. Co.

FANS, VENTILATING

354 Ventilation Units — Bulletin FM-315, 25 pp, describes basic construction of company's package propeller fans for commercial and industrial applications. Illustrated case histories of typical installations are included. Buffalo Forge Co.

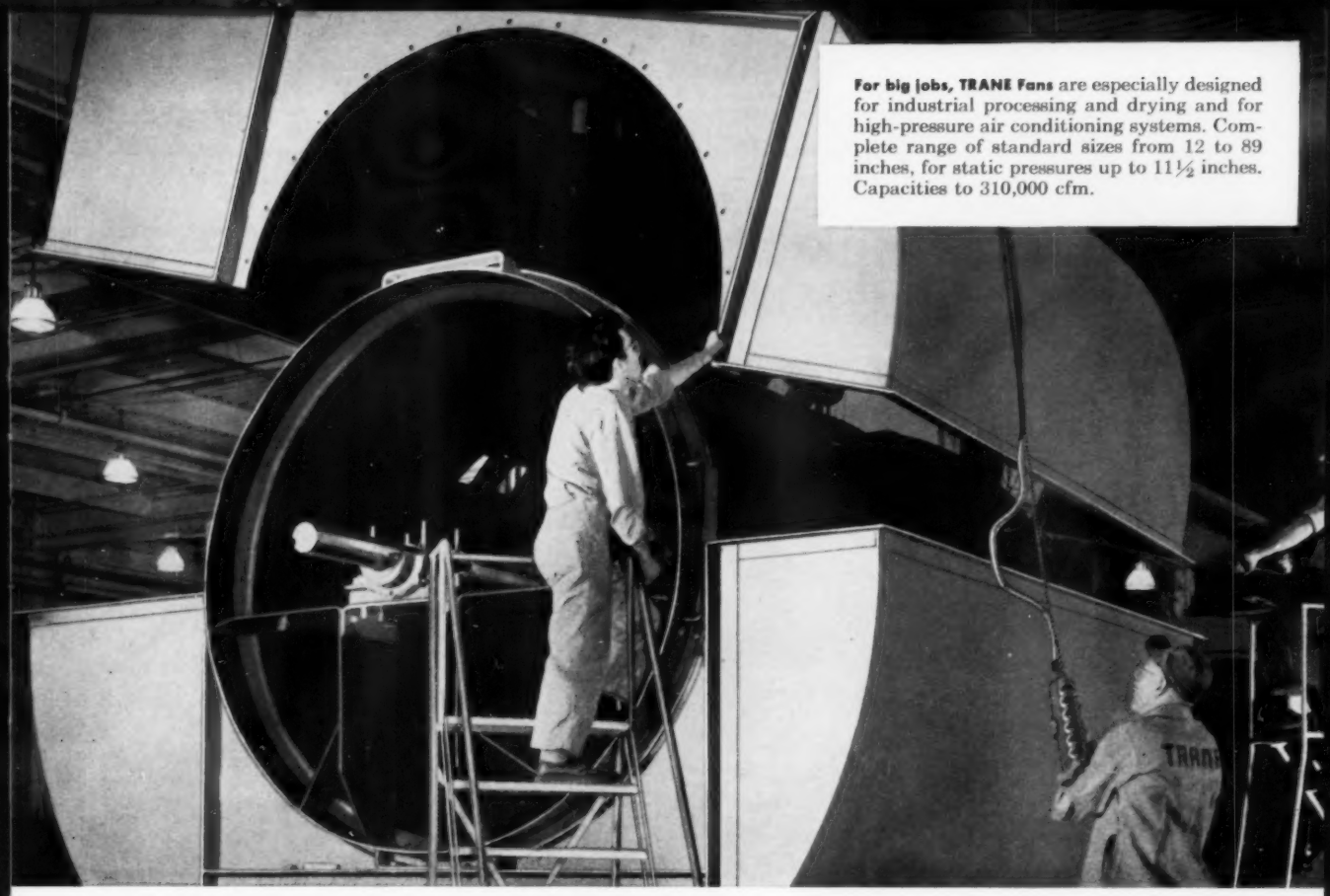
355 Air Handling Units—Complete engineering information on company's low pressure sprayed coil and high pressure dry and sprayed coil climate changers is incorporated in 56-pp Bulletin PB-290. Detailed descriptions and illustrations on the all-purpose air conditioners for commercial and industrial comfort and process applications are included. The Trane Co.

356 PVC Blowers and Fans—Advantages of unplasticized rigid polyvinyl chloride blowers and fans for exhausting corrosive air, fumes and gases are detailed in this illustrated bulletin. Physical properties of polyvinyl chloride are tabulated. Industrial Plastic Fabricators Inc.

357 Pressure Fans — Catalog 857 fully covers a new line of fan equipment for volumes from 300 to 12,000 cfm and pressures from 10 to 50-in. sp. Dimensions and capacity tables included along with quick selector charts. Clarage Fan Co.

VALVES, TRAPS, FITTINGS

359 Valve Performance Facts—Included in this 36-pp booklet are 32 case histories of cost-saving valve installa-



For big jobs, TRANE Fans are especially designed for industrial processing and drying and for high-pressure air conditioning systems. Complete range of standard sizes from 12 to 89 inches, for static pressures up to 11½ inches. Capacities to 310,000 cfm.

Choose a dependable Trane Fan for any process or comfort job!

Accurate ratings, rugged construction assure quiet, efficient operation

The fans you choose for your air-moving jobs—process or ventilation—may mean the difference between top performance and inadequate performance. That's why leading consulting engineers turn to TRANE for fans that are designed for quiet, efficient operation . . . simplified installation and maintenance—and available in a complete range of capacities and types to handle any job.

TRANE Fans are *accurately rated* and ruggedly built. Solid workmanship and the most modern tooling assure consistently dependable performance. And each TRANE Fan design has been tested and approved in the industry's most modern and complete testing laboratories.

TRANE gives you a single, reliable source for *all* your air moving jobs: giant Class I, II and III fans . . . Cabinet Fans . . . Utility Fans—all tested under the AMCA and ASHAE Code. TRANE field personnel in 97 offices are available to help you make the best selection for any air moving job.

When you need a rugged, dependable fan for human comfort or industrial process, turn to TRANE. See your nearby TRANE Sales Office, or write TRANE, La Crosse, Wisconsin.

WANT MORE FACTS? Write on your letterhead for Bulletins: FC Fans, Class I and II (DS-348-F); BI Fans, Class I and II (DS-348-B); BI Fans, Class III (DS-348-C); Utility Fans, (DS-348-U). Cabinet Fans, (DS-348-D). Axial Roof Ventilators, (DS-364-A). Centrifugal Roof Ventilator, (DS-364-C).

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MANUFACTURING ENGINEERS OF AIR CONDITIONING, HEATING, VENTILATING AND HEAT TRANSFER EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS. • SCRANTON MFG. DIV., SCRANTON, PA. • CLARKSVILLE MFG. DIV., CLARKSVILLE, TENN. • TRANE COMPANY OF CANADA, LIMITED, TORONTO • 97 U.S. AND 18 CANADIAN OFFICES

FOR ROOF APPLICATIONS new TRANE axial flow and centrifugal roof ventilators are especially designed for low silhouette, efficient air movement. Complete range of sizes and models.

PACKAGED UTILITY FANS for fast, economical installation for hundreds of plant ventilating jobs. Exceptionally smooth and quiet in operation. Capacities to 15,450 cfm.

Equipment can be engineered and designed to meet variable operating conditions. Prompt quotations upon request.

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DATA FILE

(Begins on page 176)

tions. Service applications covered include steam, oil, water, coating fluid, chlorine, phenol, pulp stock, vacuum, others. Crane Co.

360 Industrial Valves—Bulletin 507V illustrates and describes company's line of industrial valves for control of air, gas, liquids and solids. Features photos and descriptive detail on a variety of valves, including butterfly valves, wafer butterfly valves, slide valves, others. W. S. Rockwell Co.

361 Plug-Type Valves — Long-life features of company's stainless steel plug-type valves are stressed in 6-pp Form 202-A. Cutaway view illustrates important design and operation features. Jenkins Bros.

362 Composite Valves—This 24-pp catalog, Form 186, features company's line of bronze, iron, steel and corrosion resistant valves. In addition to descriptions of component features, it contains photos, cutaway views and specifications. The Wm. Powell Co.

363 Valve Lubrication—This 19-by-24-in. chart contains maintenance and lubrication information for company's lubricated plug valves. Of heavy paper with metal edges, the chart features detailed exploded views of four types of valves and includes a table of recommended lubricants for oil, water, gas and chemical service. Meter and Valve Div., Rockwell Mfg. Co.

364 Corrosion-Resistant Valves — Eight-pp Bulletin 7 contains complete engineering specifications for company's corrosion-resistant valves, as well as photos of individual types in the line. Alloy Steel Products Co.

365 Valve Comparison Chart — Form 194R-1, 22 pp, is a valve camparison chart listing valve figure numbers of 15 major manufacturers and the OIC equivalent valve figure numbers. Compares variety of valves in ferrous and nonferrous materials, describes valve liners. The Ohio Injector Co.

366 Steam Trap Book—Catalog J. 44 pp, serves as a manual on trapping practices. Includes a catalog section giving physical data and prices on cast semi-steel, and forged steel inverted bucket steam traps, compound steam traps, and ball float air and air relief traps. Handbook section tells how to calculate condensate loads, and select traps for each class of equipment, and a maintenance section covers trap installation, trouble-shooting and repair. Armstrong Machine Works.

367 Impulse Steam Traps—Bulletin T-1742, 8 pp, describes how the impulse steam trap works and includes complete details on pressures and temperatures, materials, capacities, weights and dimensions. Photos illustrate some installations. Yarnall-Waring Co.

368 Swivel Joints — Catalog G-4R, 32 pp, covers this manufacturer's line of ball-bearing swivel joints as well as other products, including loading racks,

How to beat the high cost of temperature control

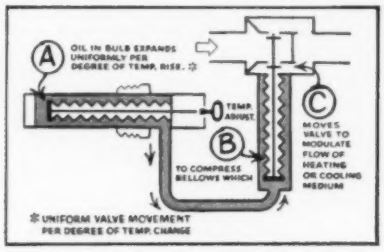
The practical approach to temperature control

By John W. Ritter, Test Engineer, SARCO Company, Inc.

Precise temperature regulation is essential in many processing operations, not only for quality control, but for maintenance of output as well.

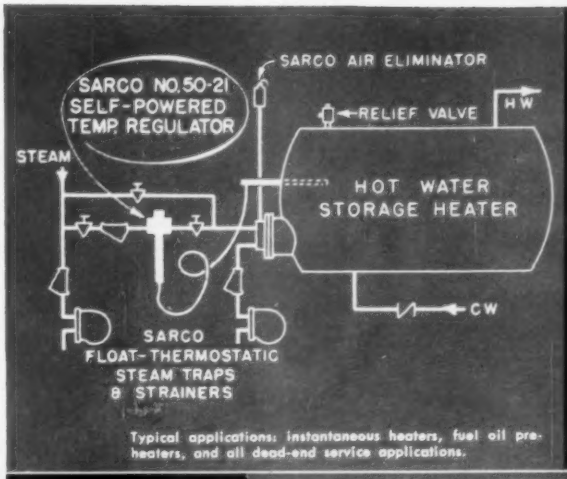
Manual temperature control is unsatisfactory because of the possibility of spoilage and loss of quality control which can result from irregular or indifferent hand regulation.

Automatic controls are available in a wide variety, including pneumatic, electronic, and self-powered. Pneumatic and electronic controls are relatively expensive to purchase and install, and may require frequent maintenance. However, in most applications, control requirements can be achieved very successfully by the use of relatively simple, economical Sarco Self-powered Regulators.

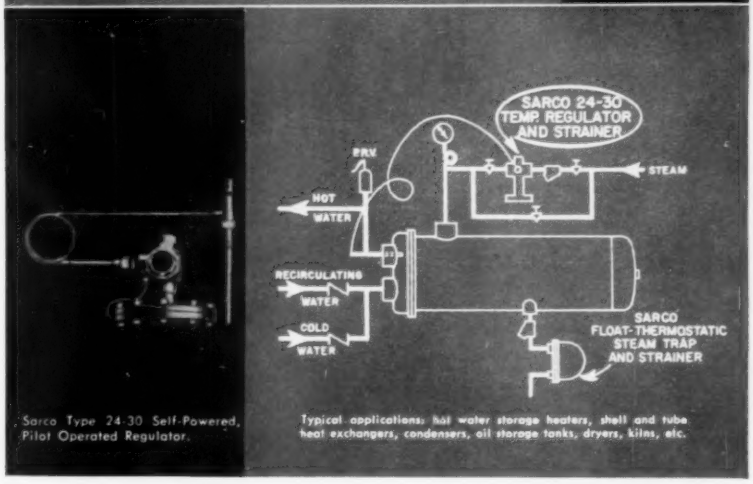

A
OIL IN BULB EXPANDS UNIFORMLY PER DEGREE OF TEMP. RISE. ✲
TEMP. ADJUST.
B
TO COMPRESS BELLOWS WHICH
C
MOVES VALVE TO MODULATE FLOW OF HEATING OR COOLING MEDIUM
✲ UNIFORM VALVE MOVEMENT PER DEGREE OF TEMP. CHANGE

This drawing shows simplicity of operation of the Sarco 50-21 Temperature Regulator, which consists of a thermostat, capillary tubing, and a valve.

Sarco controls, like the 50-21 and the 24-30, have the required degree of sensitivity and dependability, combined with the ruggedness inherent in the sealed capillary tube construction. Because these Sarco controls do not depend on external power, such as electricity or compressed air, they have established long records of sustained, reliable operation. They are an economical and practical solution to the problem of maintaining continuous watchdog duty over processing temperatures.


SARCO NO. 50-21 SELF-POWERED TEMP. REGULATOR
SARCO AIR ELIMINATOR
RELIEF VALVE
H W
STEAM
HOT WATER STORAGE HEATER
C W
SARCO FLOAT-THERMOSTATIC STEAM TRAPS & STRAINERS
Typical applications: instantaneous heaters, fuel oil preheaters, and all dead-end service applications.

Sarco Type 50-21 Self-Powered Regulator.


SARCO 24-30 TEMP. REGULATOR AND STRAINER
PRV
STEAM
HOT WATER
RECIRCULATING WATER
COLD WATER
SARCO FLOAT-THERMOSTATIC STEAM TRAP AND STRAINER
Sarco Type 24-30 Self-Powered, Pilot Operated Regulator.
Typical applications: hot water storage heaters, shell and tube heat exchangers, condensers, oil storage tanks, dryers, kilns, etc.

Self-powered automatic temperature regulators by SARCO . . .

have these 5 marked advantages: No compressed air or electrical wiring required. No delicate mechanisms to adjust or maintain. No packing glands to stick or require maintenance. No shutdown during power failure. No specialized maintenance required.

Sarco Self-Powered Controls are self-contained and can be installed by any pipe fitter. They are so reasonable in cost that you can afford Sarco automatic heating controls for every application in your plant. Write for 10-page Sarco Control Bulletin No. 620.

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COMPANY, INC.
635 Madison Ave., New York 22, N. Y.

STEAM TRAPS • TEMPERATURE CONTROLLERS • STRAINERS • HEATING SPECIALTIES

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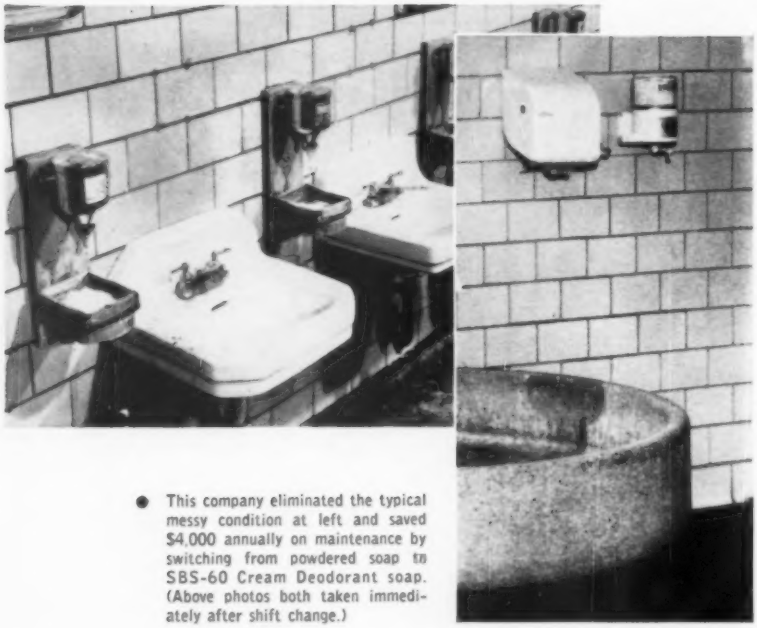

● This company eliminated the typical messy condition at left and saved $4,000 annually on maintenance by switching from powdered soap to SBS-60 Cream Deodorant soap. (Above photos both taken immediately after shift change.)

Waste soap is not the only needless expense in washrooms. Waste *maintenance* is even more costly. The company in the picture at right above saved some $4,000 a year in maintenance men's time by switching to SBS-60, the cream-type cleanser. How did SBS-60 accomplish this? Easy! One SBS-60 dispenser replaces six or more conventional powdered-soap dispensers. And the SBS-60 dispenser need be filled as little as once every three days, opposed to as often as three times daily for powders. In addition to all this maintenance time saved, of course, there is the tremendous saving in soap itself, for SBS-60 is almost impossible to waste. If you really want to cut costs, start by investigating this new concept in cleansing economy: SBS-60 Cream Deodorant soap! Write for details to dept. 58-H 3.

the washword of industry

SBS sugar beet products co.

SAGINAW, MICH. • Los Angeles, Calif. • Newark, N. J.
CANADA: Chemical By-Products, Ltd., Rexdale, Ontario

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DATA FILE

(Begins on page 176)

manifolding lines, all-metal hose. In addition to providing dimensional and operating data on products, booklet is well illustrated. Chiksan Co.

369 Wrought Iron Pipe—This 8-pp booklet on wrought iron OD piping documents some 20 typical commercial and industrial installations. These case histories show wrought iron's durability under a variety of operating conditons. ASTM specifications under which the pipe is manufactured by this company are contained in booklet, as are photo-micrographs showing the physical structure. A. M. Byers Co.

370 Polyvinyl Chloride Pipe—Characteristics and advantages of polyvinyl chloride as a material for pipe, fittings, flanges and valves are detailed in this 16-pp bulletin. Corrosion resistance table is included as well as details on operating pressures, temperatures, applications, fabrication, and installation. Dimensions and weights are also given. Grinnell Co., Inc.

371 UPVC Pipe, Fittings—Technical data and installation information on unplasticized polyvinyl chloride pipe are provided in 24-pp Booklet TTP119. Also gives specifications for threaded and socket types of UPVC fittings, valves and flanges, of normal and high-impact material. Tube Turns Plastics, Inc.

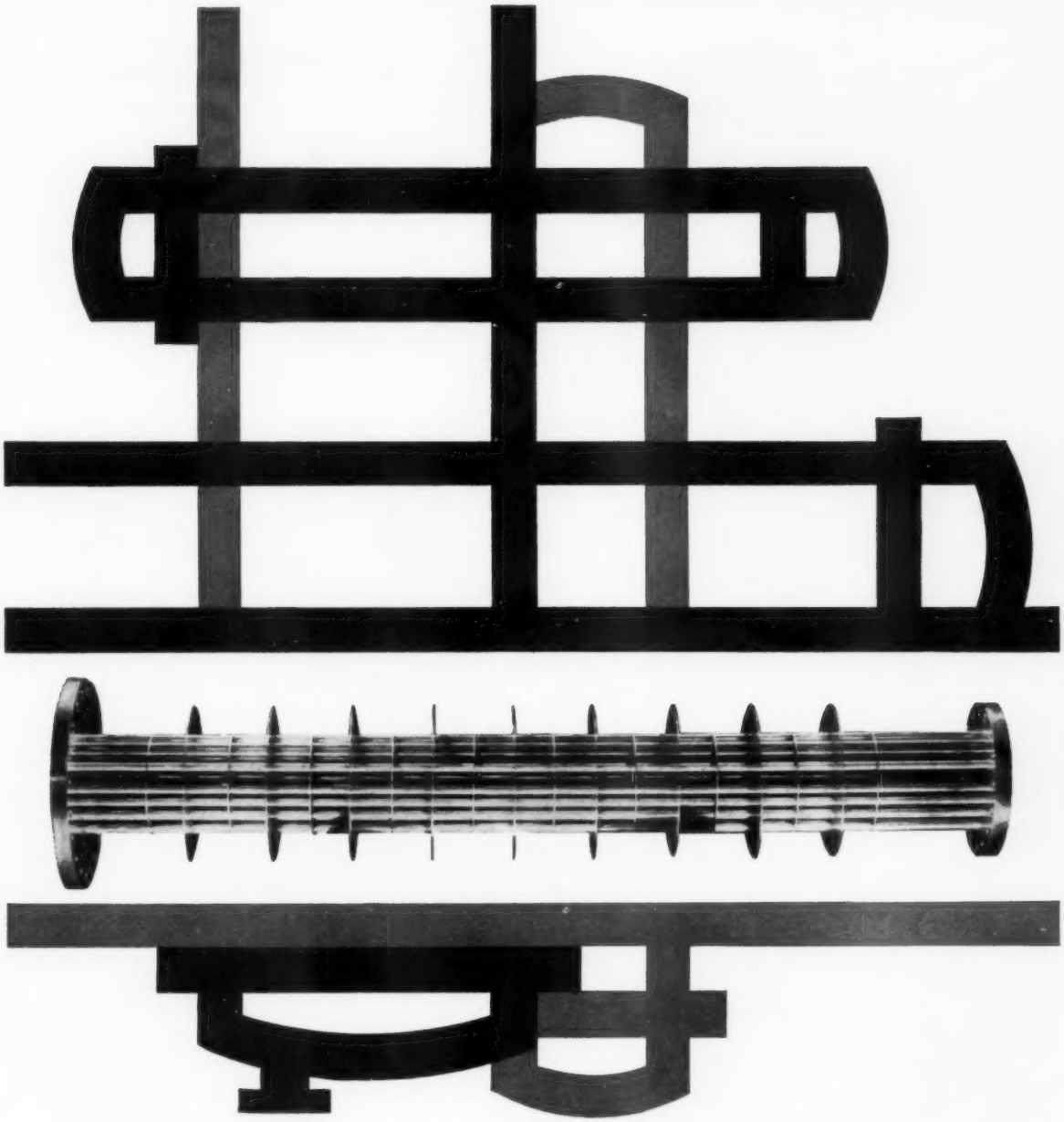
372 Glass Pipe and Fittings—Corrosion-resistant qualities of this Pyrex brand glass pipe and fittings which make it suitable for use under corrosive conditions are described in 44-pp Bulletin PE-3. Operating temperatures, physical characteristics, installation procedures are covered and specifications and dimensional drawings given. Corning Glass Works.

INSULATION, PROTECTION

373 Glass Fiber Insulation—Among the company's products described in this lilustrated bulletin are three kinds of flame-blown glass fiber insulations used for thermal and acoustical applications. Charts are included illustrating the acoustical and thermal values. L. O. F. Glass Fibers Co.

374 For Insulation Protection—Provided in this comprehensive looseleaf manual is technical information covering practically every requirement for insulation protection. An aid to proper adaptation and application of mastics, flashing compounds, adhesives and surface coatings, this book presents information classified as to industry usage, as power, process, cold storage. Book is available to qualified plant engineers. Benjamin Foster Co.

375 Insulation Specifications—This set of six specifications covers applications of Foamglas insulation for industrial equipment and piping. Each booklet contains tables of suggested thicknesses of insulation to be applied, drawings of installation procedure, supports, and recommended finishes. Booklets are devoted to low-, medium-,



win the fight against corrosion—with Alcoa Aluminum

Here's a $100-million example. The refining industry's requirements for heat exchanger tubes are 40 ft per barrel of capacity. Some 30 ft of this requirement involves exchanger applications in which Alcoa has proved aluminum is ideal. By using aluminum tubes in all those applications, the refining industry would have saved approximately $37 million in original capital investment. Capitalized at the refining industry's normal rate of return, that saving would be worth about $100 million over a 10-year operating period.

Don't shovel good money after bad by reinstalling unsuitable material. Over 30 years' experience in the process industries has given Alcoa engineers full knowledge of the aluminum alloys and installation methods by which corrosion can be eliminated. Put their knowledge to work for you. Outline your corrosion problems in a letter to ALUMINUM COMPANY OF AMERICA, 889-H Alcoa Building, Pittsburgh 19, Pa.

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Exciting Adventure
Alternate Monday Evenings

Specify Alcoa Aluminum for
corrosion-free Process Equipment
Pipe & Tube
Tanks, Containers, Trucks & Cars
Plant Structures

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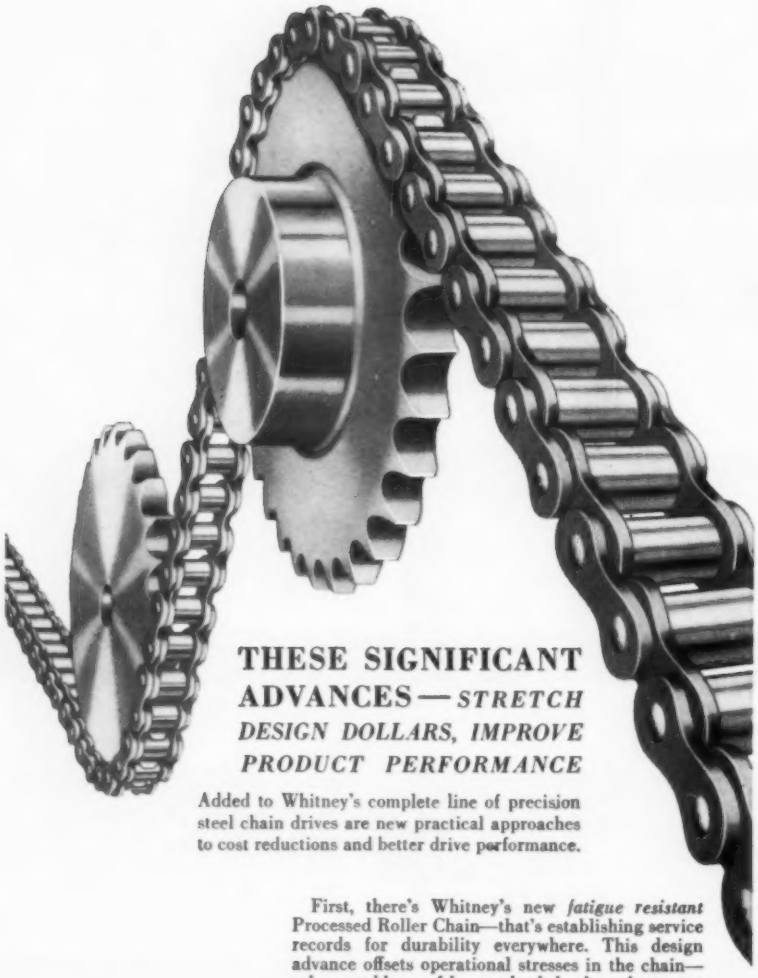


THESE SIGNIFICANT ADVANCES — *STRETCH DESIGN DOLLARS, IMPROVE PRODUCT PERFORMANCE*

Added to Whitney's complete line of precision steel chain drives are new practical approaches to cost reductions and better drive performance.

First, there's Whitney's new *fatigue resistant* Processed Roller Chain—that's establishing service records for durability everywhere. This design advance offsets operational stresses in the chain—solves problems of heavy shock loads and severest operating conditions.

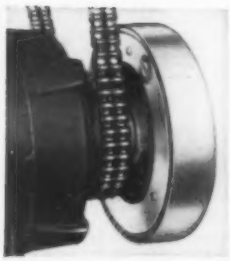
Then there's Whitney's Self-Lubricating Roller Chain—with sintered steel bushings that "oil from the inside"—are pre-lubricated for life. Ideal for installations where conventional chain lubrication may not be practical or desirable. Outlasts conventional chain as much as 5 to 1 in severe operating environments.

And if space limitations or weight are serious factors in power transmission, the new, *compact* Whitney High Capacity Roller Chain may be an effective solution.

Complete details on these design advances will be gladly supplied you.

Factory trained field engineers are available for practical recommendations on all of your chain and sprocket design problems.

Whitney Chain distributors and factory warehouses provide fast off-the-shelf service on a complete line of ASA roller chains, conveyor chains and stock sprockets.



Heard About Whitney-Tormag Magnetic Drives?

For complete motor overload protection, cushioned starts and high efficiency, ask about our new permanent magnet, self-contained power transfer unit. Available in 1 and 2 H.P. units as stock items, additional sizes up to 15 H.P. will follow.

Write for literature.

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Roller Chain • Conveyor Chain • Sprockets • Flexible Couplings • Whitney-Tormag Drives

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DATA FILE

(Begins on page 176)

high-, and dual-temperature equipment and piping, to underground piping, and spheres. Pittsburgh Corning Corp.

MATERIALS HANDLING

377 For Overhead Handling—Booklet 2008-M, 12-pp, is replete with illustrative material on principal components of overhead handling systems. Track design and advantages of supporting it flexibly are described, and formulas and figures for comparing various track systems are included. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

378 Overhead Dispatch System—Form F 192, 8 pp, describes an automatic overhead dispatch system designed to solve a variety of materials handling problems. Outstanding advantages are listed and typical installations are described and illustrated with detailed diagrams. Component equipment utilized in this system is described. Richard Wilcox Mfg. Co.

379 Industrial Cranes — Advantages of company's line of industrial cranes for a variety of applications are detailed in this illustrated bulletin GL-657. Along with illustrations of the cranes in action, it includes data on capacities, etc. Industrial Crane & Hoist, Ingersoll Products Div., Borg-Warner Corp.

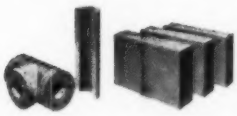
380 Hydraulic Jacks, Pullers—Bulletin Hydraulic-56, 16 pp, features company's line of hydraulic jacks and pullers. Prepared as an application guide for using various high-pressure jacking and pulling tools, it contains full descriptions, mechanical specifications. Templeton, Kenly & Co.

381 Vertical Transportation—Selection of vertical transportation for every traffic-moving job is detailed in 32-pp Bulletin A-382. Various types of elevators and escalators for a variety of commercial and industrial applications are described and dimensional diagrams illustrating arrangements included. Recommended sizes and capacities are listed. Otis Elevator Co.

383 Electric Winch — Detailed in this illustrated data sheet are advantages of company's electric winch with automatic brakes and more capacity per pound. General specifications are also included. R. G. LeTourneau, Inc.

384 Special Purpose Trucks—Catalog 104, 36 pp, describes features and applications of special purpose hand trucks. Along with illustrations of the various trucks in the line, it lists advantages of design and construction and gives full specifications. Rol-Away Truck Mfg. Co., Inc.

385 Electric Hoists — Twelve-pp Bulletin DH 133B describes Speedway electric hoists of 500- to 4000-lb capacities. Fully illustrates and explains design features and gives details on suspensions and conducting systems. Clearance data included. Wright Hoist Div., American Chain & Cable Co., Inc.



FOAMGLAS® / waterproof, vapor-proof, strong, can't burn,
INSULATION / acid-proof, vermin-proof, dimensionally stable

New AT&T Long Lines Center— where "design for survival" demanded strong, moisture-proof **FOAMGLAS** roof insulation

FOAMGLAS roof insulation forms a strong, firm base under roofing felts . . . helps prevent damage to the felts from roof traffic during and after installation. Since it can't burn, FOAMGLAS gives important extra fire protection to this AT&T building.

Typical of American Telephone and Telegraph's construction "design for survival" is the new Wayne, Pa., Long Lines center. Of bunker-style, poured concrete, the building will protect delicate electronic equipment in the severest emergency. This design called for roof insulation that was extra strong, fireproof and entirely moisture-proof. Pittsburgh Corning FOAMGLAS roof insulation was selected.

AT&T and their architects, Lorimer and Rose, New York, selected FOAMGLAS because it is strong enough to take all roof loads during and after installation. Still further protection was gained because FOAMGLAS is incombustible. Above all, its sealed glass cells form a natural vapor barrier to guarantee constant, lasting insulating value.

Your good designs deserve FOAMGLAS. Take full advantage of its many benefits. Write for complete information in our latest architectural catalog.

PC Glass Blocks are another outstanding building product of Pittsburgh Corning Corporation.

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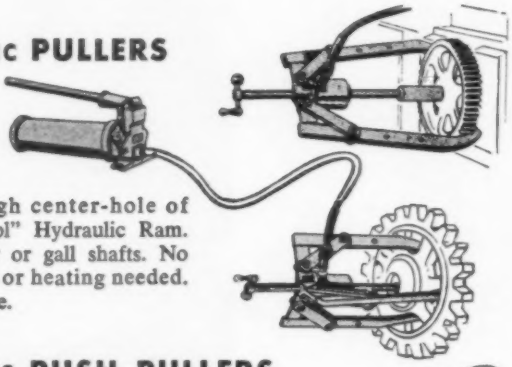
new SIMPLEX pullers

For removing and installing gears, pulleys, wheels, bearings, bearing sprockets and cups, axles and similar work. These new Simplex Hydraulic Pullers, Push-Pullers and Attachments are available separately or complete with "RE-MO-TROL" rams and pumps in 20 and 30-ton capacities.

NEW HYDRAULIC PULLERS

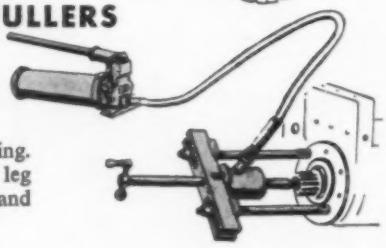
Double-Grip
Triple-Grip



Direct pull through center-hole of Simplex "Re-Mo-Trol" Hydraulic Ram. Cannot slip, wander or gall shafts. No hammering, prying or heating needed. Fast, safe, easy-to-use.

NEW HYDRAULIC PUSH-PULLERS

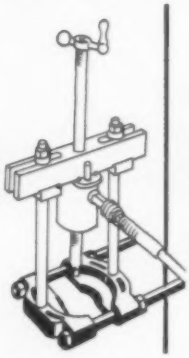
Hydraulic power supplied by "Re-Mo-Trol" Ram. Gives versatile application for direct-drive, torque-free pull through center-hole, easily, safely. No hammering, prying or heating. Reach varied by attaching 7 different leg lengths. Male and female adaptors and plugs provided.



New **ATTACHMENTS** used with new **PUSH-PULLERS**

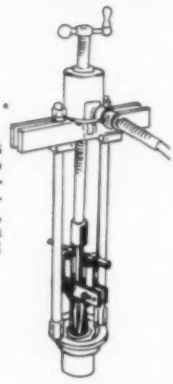
Bearing Puller . . .

Small, compact, thin-legged design permits use in restricted areas where Double-Grip and Triple-Grip Pullers will not fit. Ideal for arbor press use.



Bearing Cup Puller . . .

Strong curved fingers prevent damage to parts. Simplifies removal of bearing cups, oil-seals, bushings, sleeves, etc. especially from blind holes in cramped quarters.



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MECHANICAL AND HYDRAULIC JACKS

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RE-MO-TROL UTIL-A-TOOL **JACKS** JENNY ROL-TOE

SEE YOUR DISTRIBUTOR, or write for details

TEMPLETON, KENLY & CO.
2561 Gardner Rd.
Broadview, Illinois

For more facts circle 615 on Reply Card

DATA FILE

(Begins on page 176)

386 **Sheet and Coil-Lifters**—Bulletin SL-30, 16 pp, illustrates and describes various types of standard and semi-special lifters for one-man or automatic handling of sheet and coil stock. Advantages and design features are detailed and tables listing dimensions included. Cullen-Friestedt Co.

387 **Steel Conveyor Belts** — "A profitable approach to the selection of steel processing conveyor belts" is the subject of this 16-pp bulletin. Simplified selection, standard specifications, and installation information are included. The Colorado Fuel and Iron Corp.

SLINGS, CHAINS, WIRE ROPE

389 **Wire Rope Manual** — "Inspection of Wire Rope," "Methods of Lubricating Wire Rope," "Use and Abuse of Wire Rope," and "Sheave Maintenance" are among subjects covered in this 188-pp Wire Rope Manual, Catalog G-16. In addition, there are sections devoted to strengths and weights of wire rope, cable assemblies, and rated capacity of slings. Manual is available to qualified plant engineers, please state your job title when requesting it. Macwhyte Co.

390 **Chains, Sprockets**—Catalog 757, 68 pp, on company's stock roller chains and sprockets, stresses advantages gained through roller chain use, and pictures some typical roller chain drives. Tells how to select a stock roller chain drive. Provides specifications, ratings, prices and engineering data required for ordering. Book is generously illustrated with photos and drawings. Diamond Chain Co., Inc.

391 **Drop Forged Fittings**—Comprehensive data on company's line of drop forged fittings for wire rope and chain are presented in 40-pp Catalog 950-2. Includes specifications, dimensions, rated capacities and weights. Also announces range of sizes and capacities in many of items listed, as well as new products, including wire rope clips, others. Crosby-Laughlin Div., American Hoist and Derrick Co.

CONSTRUCTION

392 **Aluminum Building Products**—Form AD 285 is a 32-pp catalog covering company's line of aluminum industrial building products. Cites advantages of aluminum, pictures some installations. Installation data, weights, dimensions and roughing-in details are provided on corrugated roofing and siding, V-beam roofing and siding, ribbed siding sheet, perforated corrugated sheet, flat flashing sheet. Aluminum Co. of America.

393 **Expanded Metal Uses** — This 10-pp "George Nelson Sketchbook" presents in sketch-form current and projected uses of expanded metals. Sketches are those of noted industrial designer and they illustrate some unusual applications for this strong, lightweight aluminum or steel material. United States Gypsum Co.

Unique packing retention method eliminates test rings

simplifies inspection and servicing reduces maintenance time

Paracoil

TYPE "PC" EXCHANGER

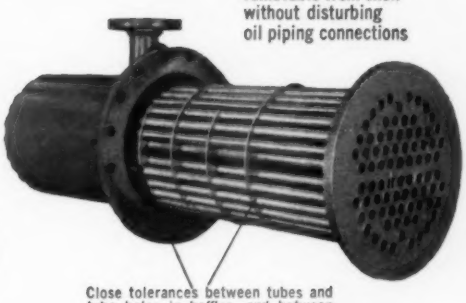
Straight-tube exchanger for oil, water, air or gas

Exclusive "retainer ring" design, available only in Paracoil "PC" Exchangers, **permits shell side pressure test with bonnet removed. No auxiliary equipment or special devices are required to hold tube sheet packing against pressure.** By backing off only one set of nuts, bonnet may be removed without displacing packing or retainer ring. Pressure may be applied to shell side to test for defective tubes or leaking tube joints. With bonnet off, retention studs hold retainer ring and packing in place.

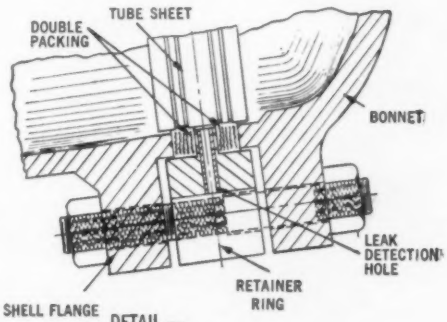
Leak detection holes in retainer ring show leakage from either tube or shell sides (See detail below).

Tubes may be tested, re-rolled, even replaced, without removing tube bundle from shell.

Tube bundle easily removable from shell without disturbing oil piping connections

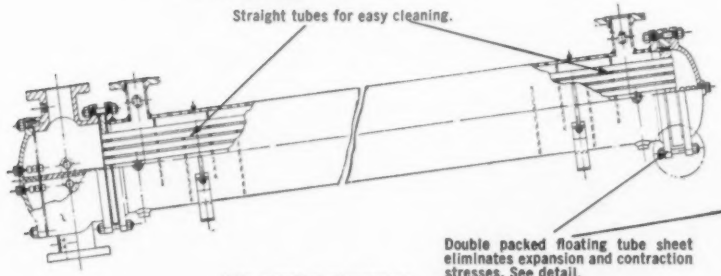


Close tolerances between tubes and tube holes in baffles, and between baffle periphery and shell, assure maximum heat transfer.



DETAIL — *Section thru floating tube sheet, showing packing and detection hole in retainer ring.*

Straight tubes for easy cleaning.



Double packed floating tube sheet eliminates expansion and contraction stresses. See detail.

Wide selection of materials as dictated by service requirements.

Standard commercial, ASME or Marine Code construction.

HOW IT WORKS

Mixing of shell and tube side fluids due to packing failure is impossible in this Paracoil Type "PC" design. Any leakage from either side, resulting from loosening of bolts or worn packing, escapes through the detection holes. The operating personnel is thus on notice that servicing is required.

Paracoil
HEAT TRANSFER EQUIPMENT

Write for descriptive Bulletin 140

Since 1915

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30 Rockefeller Plaza, New York 20, New York

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Are power starved tools stealing your profits because your air compressors are laying down on the job . . . or not fitted to the operation? Then be sure, be safe and be satisfied with Wayne Compressors . . . "engineered to the job."

Wayne Compressors give you guaranteed, full-rated usable air output . . . take the guesswork out of air-power in your plant. Make a quality comparison of Wayne Compressors with all others. You'll select Wayne for higher quality, more production and lower cost per cubic feet of air produced. Write for free copy of air compressor guidebook to Wayne Pump Company, Industrial Division, Fort Wayne 4, Indiana, Division of Symington Wayne Corp.

QUALITY FEATURES	WAYNE	A	B	C	D	E	F	G	H
DUAL PAN CONSTANT LEVEL OILING SYSTEM	YES	NO	NO	NO	NO	NO	NO	NO	NO
DUAL INTAKE VALVES	YES	NO	NO	NO	NO	NO	NO	NO	NO
SMOOTH COPPER TUBING INTER. & AFTERCOOLER	YES	NO	NO	YES	NO	YES	YES	NO	NO
TAPERED CRANKSHAFT FOR FLYWHEEL ATTACHMENT	YES	NO	NO	NO	NO	YES	YES	NO	NO
FOUR PIECE OIL RESERVOIR, CRANK CASE, CYLINDER AND HEAD CONSTRUCTION	YES	NO	NO	NO	NO	NO	NO	NO	NO
THERMAL PROTECTION STD. EQUIPMENT	YES	YES	NO	NO	NO	NO	YES	NO	NO
FOUR PISTON RINGS	YES	YES	NO	YES	NO	YES	NO	YES	NO

Wayne
Industrial Products

THE WAYNE PUMP COMPANY
Industrial Division
Fort Wayne 4, Indiana
Division of Symington Wayne Corporation

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DATA FILE

(Begins on page 176)

395 Building Panels, Panes—Form SL-3, 8 pp, presents Structoglas A reinforced plastic corrugated building panels and flat panes, giving information on product's mechanical and physical properties, chemical resistance, colors and finishes. Installation instructions cover sidewall mounting, roof construction. Skylight construction and continuous windows are shown. Structoglas Div., International Molded Plastics, Inc.

397 Face Brick — Brochure B-158 contains a set of 24 color reproductions which illustrate the wide range of glazed and unglazed facing brick for all types of interior and exterior walls. Also included is detailed information regarding size, color and availability of Standard, Roman, Norman and SCR brick. Natco Corp.

398 Structural Glass — Catalog 58-1 contains essential data on company's line of rolled, figured and wired glass for a variety of industrial applications. Advantages and important functions are described, and light distribution tables and specifications are included. Mississippi Glass Co.

399 Foundation Pipe Piles—Comprehensive information on Taylor Forge spiral-weld foundation pipe piles is presented in a 24-pp Form F-5677 In addition to detailed specifications, the illustrated booklet describes a number of pipe-pile installations and includes driving logs. L. B. Foster Co.

400 Pre-Fab Flooring—Advantages, construction details and typical installations of prefabricated floor sections (rafts) are presented in illustrated Bulletin 7. Shows how they provide a strong, reinforced, mobile flooring combining sub-floor and wearing surface. Also describes anchor steel plates for severe conditions and prefabricated flags for new or old floors. Stelcon Industrial Floors, Inc.

401 Steel Floor Plate—Skid resistance and other advantages of USS multigrip rolled steel floor plate are stressed in this illustrated bulletin. Also gives dimensions, data on allowable loads. United States Steel Corp.

402 Non-Slip Flooring — Algrip, an abrasive rolled steel floor plate described as non-slip even on steel inclines, is the subject of Booklet AL-29, 8 pp. Discusses safety features, fabricating. Alan Wood Steel Co.

BOILERS AND GENERATORS

403 Packaged Automatic Boiler—Six-pp Bulletin 1241 describes company's packaged automatic boilers for both air atomizing and pressure atomizing, for oil burning and for gas. Covers operating features and includes chart listing ratings, dimensions, weights. Orr & Sembower, Inc.

404 Package Boilers—This 12-pp booklet on package steam generators describes the formulas behind all pack-

A new type of industrial smokestack by Van-Packer

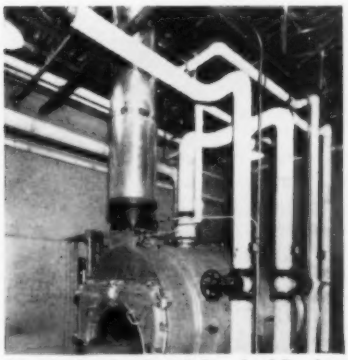
Outlasts steel stacks, costs no more

Won't corrode — The Van-Packer industrial smokestack is made of centrifugally-cast 3-foot refractory sections that will far outlast a steel stack. An aluminum jacket encases each section and eliminates maintenance.

Economical — The Van-Packer costs no more than a steel stack; 2/3rds less than a brick stack. Easy installation, savings on maintenance, and long life results in further savings. Provides high draft equal to that of a comparable brick stack.

For boilers or incinerators — Van-Packer stacks can be installed inside or outside to handle boilers, furnaces or incinerators. Comes in seven diameters from 10-inch ID to 30-inch ID. Handles all fuels.

Available nationwide—Van-Packer Stack is available through local Van-Packer Jobbers and Special Representatives. See "Chimneys — Prefabricated" in Yellow Pages, or write Van-Packer for Bulletin IS-32-58.



Van-Packer Stack with Standard Sections handles boilers and furnaces efficiently. Can be superimposed or floor supported.

Installing this stack is quick and easy. Three-foot sections are simply cemented atop one another with acidproof cement.

Van-Packer Stack with Hi-Temp Sections handles industrial incinerators with continuous flue gas temperatures of 2000° F.

Van-Packer PREFABRICATED REFRACTORY **Stack**

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P. O. Box No. 306, Bettendorf, Iowa • Phone: East Moline, Ill. 3-5288

Sweet's

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DATA FILE

(Begins on page 176)

age steam generators, and illustrates how installation of a package steam generator can raise steam capacity in an existing boiler room without extensive structural changes. Cyclotherm Div., National-U. S. Radiator Corp.

406 Package Unit Steam Generators—Bulletin PSG-2 has line drawings, photos, and engineering data on portable type units from 10,000 lb/hr to 40,000 lb/hr steam capacities. Available in three standard pressures of 175, 250, and 375 psi gage. Henry Vogt Machine Co.

407 Packaged Generators—This 16-pp catalog describes a series of packaged steam generators in sizes from 10,000 to 46,000 lb of steam per hour. Gives capacities, dimensions, construction features. Instrumentation is discussed. Illustrations include sectional drawings. Foster Wheeler Corp.

MAINTENANCE

409 Basic-Roofing Information—"What You Should Know About Your Roof" is a 40-pp clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of good re-roofing job. Johns-Manville.

410 Tough Floor Topping—Chemi-Top a corrosion resistant floor topping for food processing, chemical and other plants having severe floor corrosion problems, is discussed in 8-pp Form A515R. What Chemi-Top is, and what it can do, are explained. Two basic formulations and three service types are covered, also a non-skid type of floor topping. The Garland Co.

411 Industrial Vacuum Cleaning—Twelve-pp Bulletin 155 B describes both stationary vacuum cleaning equipment and portable industrial vacuum cleaners, the latter in both light and heavy-duty types. Recent improvements in collection and dumping methods are covered, and photos show application to conveying, reclaiming, bench work. Spencer Turbine Co.

412 Vacuum Units—This bulletin describes heavy-duty, portable vacuum units designed for a variety of plant housekeeping jobs. Application in removing litter, conveying or reclaiming materials, and collecting hazardous matter is covered. Invincible Vacuum Cleaner Mfg. Co.

413 Maintenance Manual—Effective methods of sweeping and mopping floors are described in this 20-pp manual. Diagrams map out the step-by-step routine for sweeping and mopping various types of areas. Huntington Laboratories, Inc.

414 For Overhead Maintenance—Bulletin G205RR, 8 pp, tells how to control costs when maintenance goes above arm's reach—for painting and cleaning, electrical work, etc. Pictures a variety of scaffolding arrangements. Provides brief product information on steel and aluminum scaffolding, ladders and extension trestles. The Patent Scaffolding Co., Inc.

FILTERS

416 Filters, Strainers—Industrial Catalog 1058, 48 pp, provides application and engineering information on company's line of micro-filters and precision strainers. Fuel filters, full flow and by-pass lube filters, dry type air filters, air separators, and metal edge strainers for fuel lube and industrial use shown. Purolator Products, Inc.

Postage-free Reader Service Cards make it easy to order catalogs. Cards are provided on pages 171 and 172.

417 Filters For Industry—This loose-leaf notebook contains a series of bulletins with detailed information and specification data on filters, aftercoolers and cyclone separators. Among those featured are Bulletin 117 on air filters, Bulletin 431 on filters for the chemical process industries, Bulletin 650 on general service filters and Bulletin 711 on cyclone separators and pipe line aftercoolers. R. P. Adams Co., Inc.

418 Pipe Line Filters—Eight-pp Bulletin 200 contains detailed informa-

control condensate corrosion

An example of pipe after attack by condensate corrosion.

increase heat transfer—reduce maintenance with HAGAFILM®

Hagafilm, the safe filming amine, forms a non-wettable film on all metal surfaces, including copper and its alloys. Fed to the boiler, to the feedwater, or directly to steam lines in economical quantities (2 to 3 lbs. per 1,000,000 lbs. of steam), Hagafilm forms a thin, tough coating which controls corrosion. Its non-wettable character promotes dropwise condensation which can increase heat transfer.

Hagafilm is available in both solid and liquid forms and is safe to handle and use. Hagafilm cleans out old corrosion deposits, reduces maintenance costs and keeps valves, traps and pumps at top efficiency.

Write for free bulletin. Learn how Hagafilm can save money and time in every operation where steam is used.

HAGAN CHEMICALS & CONTROLS, INC.

HAGAN BUILDING, PITTSBURGH 30, PENNSYLVANIA
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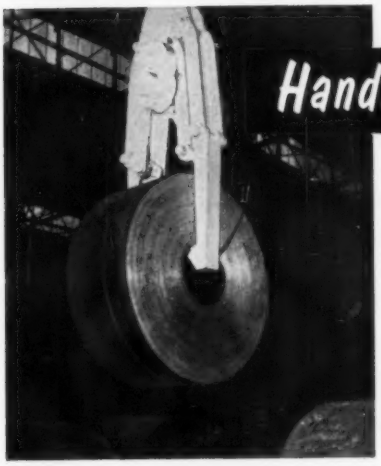

CHECK THESE

C-F Lifter ADVANTAGES

- 1 Lifter handles wide range of coil sizes
- Requires minimum of only 10" to 12" between piles — saves storage room
- 1 man operation — eliminates hookers
- Positive grip on coil — no damage to material

• C-F Coil Lifters are saving time and labor in many plants and warehouses because they can pick up, carry and set down a coil of steel faster and safer than any other method. Infinite jaw openings permit handling a very wide range of coil widths . . . carrying legs open fast, stay open until operator closes them on coil. Narrow legs require minimum space between piles —a space saving advantage. Made in motorized models for crane cab or pendant operation as well as manual types with chain wheel, in capacities from 3 tons up. Powered Rotating Heads available. Opening ranges to suit your requirements.

Write for illustrated Bulletin.

CULLEN-FRIESTEDT CO.

1317 South Kilbourn Avenue • Chicago 23, Illinois

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This cracked iron housing begged for retirement

But it was hard for the company to comply when they found a new pump housing would cost $1800, would take 90 days for delivery, and would lay off 40 men during the shut-down.

So they sent it over to Lawton-Schrader, a welding company in Richmond, Virginia to see if it could be repaired. Their weldors said it could be *permanently* repaired with Ni-Rod* "55" Electrodes. And they did it. All it took was 8 hours, 5 passes, and 23 pounds of Ni-Rod "55" Electrodes which also eliminated the need for pre and postheating.

Back on the job in 1½ days, this pump housing is expected to last till the pump wears out. And the total cost came to $384, a saving of over $1400.

Good to keep in mind and on hand

The example above brings out two good points. One . . . it's a good idea to keep Ni-Rod "55" in mind for emergency repair of cast iron parts. Two . . . it's even a better idea to keep a supply on hand to meet these emergencies when they come up.

Ni-Rod "55" makes permanent repairs possible with a minimum of time lost, and with a minimum of effort and money spent. It offers you a practical way to salvage defective castings and to join cast irons to other metals. It's ideal for building up worn or undersized areas. Machinable Ni-Rod "55" deposits give service as good or better than the original metal. And in 9 out of 10 cases, no preheat or postheat is needed.

Booklet gives complete data

"Repair Cast Iron Parts Quickly and Easily" tells the Ni-Rod "55" story in detail. It's yours for the asking. Write:

*Registered trademark

THE INTERNATIONAL NICKEL COMPANY, INC.

67 Wall Street INCO New York 5, N.Y.

INCO WELDING PRODUCTS

Electrodes • Wires • Fluxes

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DATA FILE

(Begins on page 176)

tion on pipe line filters for air and other gases. Double action principle which gives sustained, trouble-free operation at high load factors is illustrated and explained. Specifications are included. Dollinger Corp.

MECHANICAL POWER TRANSMISSION

419 Magnetic Drives—Data on design, drive features, opening and performance, curves, output torque rating-dimensions, selection chart, as well as photos of installations and applications are included in 6-pp Bulletin W-T 1-57. Whitney Chain Co.

421 Plastic-Cored Belt—Detailed information on company's plastic-cored belting is presented in two bulletins. One presents design and application data as well as selection tables, on Tanastic—a plastic-cored flat belt with chrome leather. The other bulletin covers Texalon—a combination of woven textile and flat ribbons of extruded nylon. J. E. Rhoads & Sons.

422 V-Belt Manufacture—Machines and processes used in the production of V-belts are described in 16-pp Booklet S-51106. Rubber compounding, preparation of fabric, building steps, curing and finishing are covered. The Goodyear Tire & Rubber Co.

424 Flexible Couplings—Condensed Engineering Catalog 51-A contains excellent data on the choice and use of company's flexible metal couplings for power transmission. Tells advantages of these couplings and discusses design. Describes double-flexing and floating shaft types, light duty couplings and types. Thomas Flexible Coupling Co.

425 Mill Bearings—Eight-pp Book 2665 describes company's line of mill bearings with heavy duty, self-aligning roller bearings and steel housings. Dimensional data and diagrams are provided. Link-Belt Co.

MUELLER BRASS CO. PVC

(POLYVINYL CHLORIDE)

RIGID PLASTIC PIPE AND FITTINGS

for dependable, low cost chemical handling and industrial piping

CORROSION RESISTANT PVC pipe and fittings are immune to the corrosive action of most acids, alkalies, liquids and gases. The smooth interior walls minimize the build-up of deposits, assuring unrestricted flow.

DURABLE AND DIMENSIONALLY STABLE PVC has high tensile strength and the durability to withstand heavy shock loads, vibrations and rough handling. Dimensional stability is excellent under stress, impact and moderately high temperature.

ECONOMICAL MUELLER BRASS CO. PVC products provide a low-cost solution to corrosion problems . . . lightweight for fast, easy handling . . . rugged, long wearing, no need for frequent replacement. Either threaded or solvent cemented piping systems can be readily installed.

Write today for your free samples

NORMAL IMPACT PVC — good impact strength . . . maximum chemical resistance

HIGH IMPACT PVC — maximum impact strength . . . high chemical resistance

Pipe is fabricated in 20′ lengths; ½″ through 3″ sizes — I.P.S. schedules 40 and 80. Fittings are available in ½″ through 3″ sizes; threaded and socket-type for schedule 80 and in socket-type only for schedule 40.

MUELLER BRASS CO. PORT HURON 50, MICH.

Polyethylene pipe and plastic fittings, copper tube, valves and fittings

For more facts circle 622 on Reply Card

TUBING, HOSE

427 Heat Exchanger Tubing—Cited in this 30-pp catalog are typical cases where cupro-nickel or Monel tubing installed in heat exchangers resulted in substantial savings and better efficiency through longer tube life. Describes applications of this tubing. The International Nickel Co., Inc.

428 Flexible Metal Hose—Contained in this 36-pp bulletin is detailed information on characteristics and applications of company's flexible metal hose designed to serve a variety of industrial needs. Includes specifications, list of applications, and photos of the various types of hose available. Typical installations pictured. Pennsylvania Flexible Metallic Tubing Co., Inc.

429 Industrial Hose — Bulletin IH-10 features application and selection data on industrial hose, including braided, horizontal braided, wire braided, wrapped and braided, wire woven, smooth bore and rough bore. Descriptions of each type of hose are followed with application information and dimensional data. The Gates Rubber Co.

INSTRUMENTS, CONTROLS

430 Pressure Gages—In 16-pp Catalog 305 are described gages, with and without integrated switches, used most widely in operation of power and steam plants, refrigeration systems, metal working industries, hydraulic presses, and others where steam, water and non-corrosive oils and gases are principal measured media. Specifications included. United States Gauge, Div., American Machine and Metals, Inc.

431 Stroboscope Data—Applications of the electronic stroboscope are illustrated and described in 8-pp Form 766-C. Includes complete descriptive and specification data on the Strobotac—a small, portable stroboscope tachometer—as well as on the Strobolux, the Strobolume and the Microflash. General Radio Co.

432 Resistance Temperature Detectors—In 8-pp Publication 3016D are described a line of remote temperature-sensitive elements for use in indicating, recording, controlling and monitoring equipment. Operations, application and construction details of the resistance temperature detectors are presented, along with specifications. Instrument Div., Thomas A. Edison, Inc.

DATA FILE

(Begins on page 176)

433 Gages, Needle Valves—Catalog 76-G consists of a loose-leaf bound collection of literature on gages and needle valves. Various types of gages are illustrated and described, with applications and specifications fully detailed. A section on accessories is included. Jas. P. Marsh Corp.

OTHER EQUIPMENT

434 Products and Services—Bulletin GSP-901 24 pp, describes products and services of this company and its various divisions. These include ring balance instruments, components for control systems, electronic devices, force measuring devices, water and steam treatment, testing equipment. Hagan Chemicals & Controls, Inc.

435 Feedwater Treatment—Process Bulletin B1, "Treatment of Boiled Feedwater by the Direct, or Indirect Method," discusses advantages of direct treatment, as a complete treating program or as a supplement to external systems. Explains why direct treatment is convenient, economical, and complete. National Aluminate Corp.

436 Preheating Combustion Air—This well-illustrated 36-pp booklet explains fuel savings and increased performance made possible by using waste heat in flue gases to preheat incoming combustion air. Also covers increased boiler output, ability to use lower grade fuels. Air Preheater Corp.

437 Industrial Stack—Detailed information on a permanent, low cost refractory smoke stack for commercial and industrial applications is contained in 8-pp Bulletin IS-32. Gives product information, applications with boilers, furnaces, etc. Van-Packer Co., Div., The Flintkote Co.

438 Shop Equipment—Work benches, tool stands, shelving and other pressed steel equipment for the shop, laboratory and assembly line are shown in 8-pp Form 2299. Construction features and specifications of size, top material, equipment variations given. Standard Pressed Steel Co.

439 Testing Skin Cleansers—The use of radioactive material to check the cleansing efficiency of various materials and formulas used in production of skin cleansers by this manufacturer is described in this brochure. Basic steps in the test are illustrated. The Sugar Beet Products Co.

440 Overhead Doors—Sixteen-pp Catalog F 4644-9 presents industrial and other overhead doors. Gives information on Weather-King flush overhead door sections, combining sandwich construction with weatherproof facing. Door panels, electric operators described. Barber-Colman Co.

441 Phenolic Plastics—A primary evaluation of the properties of company's phenolics and the combinations in which they are available, in thermosetting molding materials and industrial and coating resins, is featured in this illustrated bulletin. Durez Plastics Div., Hooker Chemical Corp.

442 Industrial Finishing Equipment—Catalog A 657, 12 pp, describes a complete modern finishing system for cleaning, rust proofing, drying, painting and finish baking operations. The R. C. Mahon Co.

443 Incinerators—Features and advantages of company's incinerators for a variety of industrial applications are detailed in this 16-pp "Incinerator Bluebook." Includes selection chart as well as data on waste analysis, classifications, methods of feeding or charging of refuse, and detailed specifications. Joseph Goder Inc.

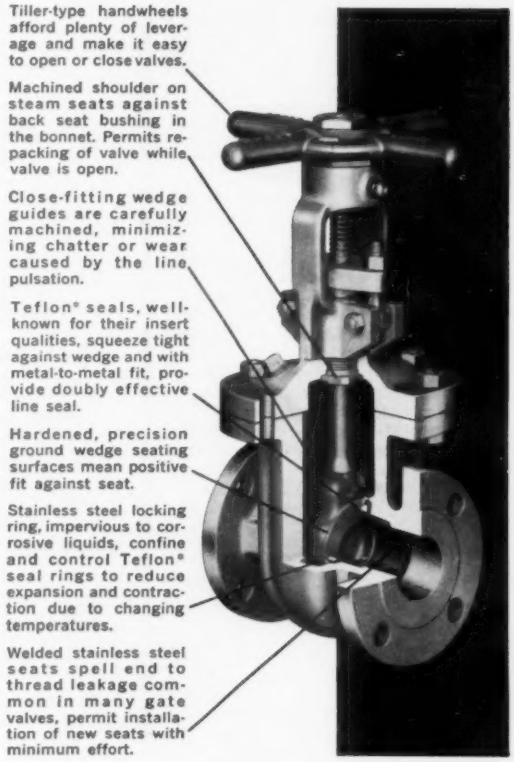
444 Equipment Selector Charts—Bulletin CE-50, 20 pp contains selector charts on corrosion-resistant equipment for process industries. Tables cover general considerations in selection of material, physical properties, corrosion resistance, techniques and skill in manufacture of equipment. Describes rubber and plastic pipe, tubing and fittings; valves; pumps; lined tanks. American Hard Rubber Co.

445 Fly Ash Collector—This 6-pp bulletin describes the "LR," a fly ash collector for efficient fly ash prevention on small boiler installations of limited draft. Collection efficiences are shown on graph. Buell Engineering Co., Inc.

Two-Way-Sealing Hamer *Leakproof* Gate Valves

ASSURE POSITIVE SHUT-OFF

UPSTREAM AND DOWNSTREAM!


Tiller-type handwheels afford plenty of leverage and make it easy to open or close valves.
Machined shoulder on steam seats against back seat bushing in the bonnet. Permits repacking of valve while valve is open.
Close-fitting wedge guides are carefully machined, minimizing chatter or wear caused by the line pulsation.
Teflon* seals, well-known for their insert qualities, squeeze tight against wedge and with metal-to-metal fit, provide doubly effective line seal.
Hardened, precision ground wedge seating surfaces mean positive fit against seat.
Stainless steel locking ring, impervious to corrosive liquids, confine and control Teflon* seal rings to reduce expansion and contraction due to changing temperatures.
Welded stainless steel seats spell end to thread leakage common in many gate valves, permit installation of new seats with minimum effort.

You can count on absolute leakproof line shut-off when you install Hamer Leakproof Gate Valves . . . because Hamer Leakproof Gate Valves incorporate double sealing action – metal-to-metal fit of the wedge plus two Teflon seals. *Positive* shut-off, both upstream and downstream, saves the cost of double block and and bleed installations required in many gate valve installations. Hamer Valves save money too because they last longer and require less maintenance.

If yours is a valve problem, regardless of type or application, it will pay you to call on Hamer for help.

Send for FREE, illustrated catalog.

Hamer VALVES, INC.

P. O. Box 1851 • 2919 Gardenia Ave., Long Beach 1, California

Representatives throughout the World

*Reg. T. M. DuPont

58-2A

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Note imbedded Nylon plug locks screw automatically
SEXAUER
EASY-TITE
Note Fiberglas backing – resists closing squeeze

NEW WAY TO

Prevent Faucet Leaks!

★ **9 out of 10 washers are fastened with screws that are TOO LONG or SHORT. The screws quickly loosen; the loosened washers are destroyed thru grind and squeeze of opening and closing faucets.**

34 years of research uncovers new solution

★ **Now, NEW (Patented) 'Sexauer' SELF-LOCK Monel screws, with an imbedded expanding NYLON PLUG, lock at the required depth AUTOMATICALLY, hold washers FIRMLY! Made of rustproof, non-corroding Monel, heads don't twist off, screw slots don't distort. They are easily removed when necessary, can be re-used repeatedly.**

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for the plant engineer

Cable Installation

CABLE INSTALLATION PRACTICE. Size 11 by 8½ in.; 20 pp; illustrated; paper bound. Available from the Technical Publications Division, Rome Cable Corporation, Rome, N.Y. Price $1.00.

THIS BULLETIN is a complete section from the revised Rome Cable Manual of Technical Information. It is punched for notebook insertion and has extra-tough grease-and-dirt resistant cover.

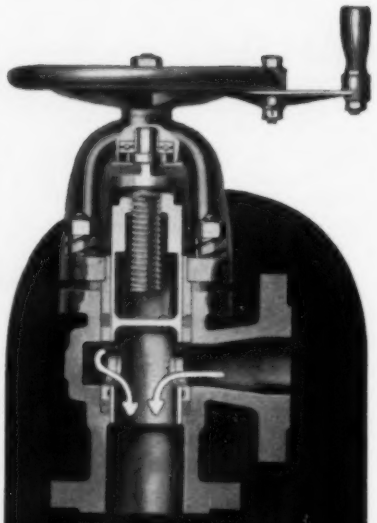
The booklet's coverage of subjects deals with types of installations, pulling tensions and compounds, general instructions for splicing power cables, splicing materials, arc-proofing, splicing control cables, and other items.

Business Humanics, Economics

MANAGEMENT REPORTS. Size 11 by 8½ in., paper bound. Published by Research Division, California Personnel Management Association, Farm Credit Bldg., 2180 Milvia Street, Berkeley 4, Calif. Price $1.00 each.

HELPING SUPERVISORS UNDERSTAND what makes their employees "tick" is the basis for this 7-page report, No. 235. J. Herman Mattson, Training Consultant Director, Western Management Assn., explains what the supervisor should look for and how he should handle the four areas of personal activity that deals with thought, society, emotion, reaction to stimuli. He especially stresses "awareness," stating that "Awareness is the key to understanding emotional problems." The author points out that as we go more and more into automation we are going to need larger numbers of men of supervisory capacity who are capable of understanding and dealing with the emotions of their employees.

MEASURING AND IMPROVING PERSONNEL PROGRAMS, Report No. 260, 10 pp. This stenographic brief of a talk prepared by Guy B. Arthur Jr., emphasizes the fact that one of the most important jobs in the field of personnel work today is learning how to alter human behavior. He gives examples and provides questions and answers that some of our leading industrialists have used to



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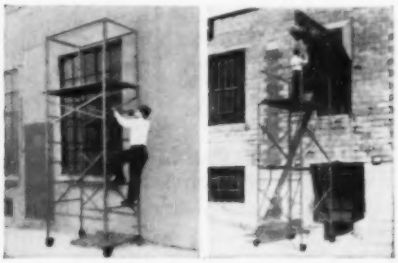
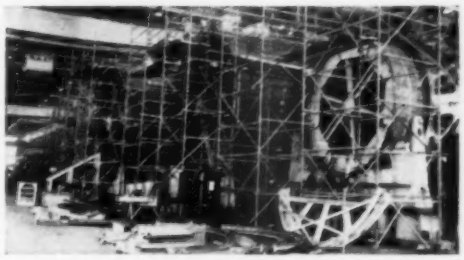
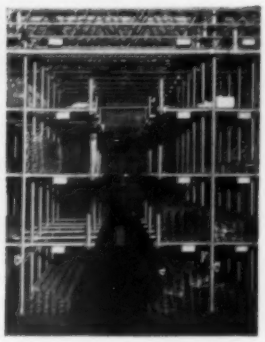




"TubeLox"© Scaffolding

Made of only four basic parts, this scaffolding is erected to conform to any shape, size or contour. Adjustable couplers and tubes of various lengths permit unlimited design. Above, workers get all around curved shapes of atom subs. Right, couplers and interlocking steel tubes make heavy-duty storage racks.



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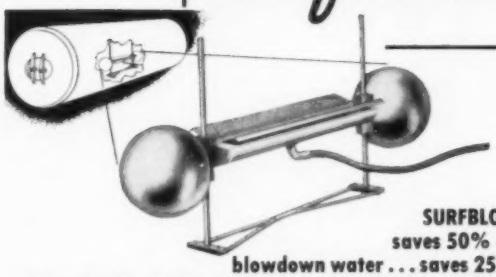

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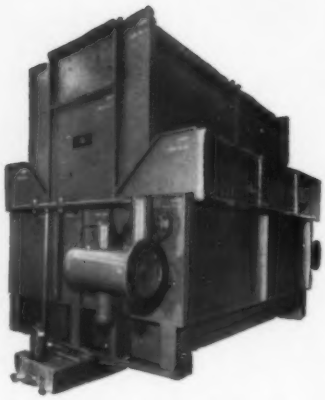
ECONOMICAL COOLING OF GASES AND COMPRESSED AIR



Cooling gases or cooling and removing moisture from compressed air, the Niagara *Aero* After Cooler offers the most economical and trustworthy method. Cooling by evaporation in a closed system, it brings the gas or compressed air to a point below the ambient temperature, effectively preventing further condensation of moisture in the air lines. It is a self-contained system, independent of any large cooling water supply, solving the problems of water supply and disposal.

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NEW BOOKS

great advantage over the past few years, at the same time emphasizing the fact that we need managers and supervisors who will run a "tight ship" and regain the respect of their employees.

THE OUTLOOK FOR WAGES AND PROFITS, Report No. 239, 7 pages, pertains to an address delivered by Louis J. Kroeger of Louis J. Kroeger and Associates, San Francisco and Los Angeles. This material sheds some light on the inter relationship of labor, management and government in the economic picture.

On Welded Design

AIDS TO EFFICIENT MACHINE DESIGN IN WELDED STEEL. Size 11 by 8½ in.; 94 pp; illustrated; paper bound. Published by the Lincoln Electric Co., 22801 St. Clair Ave., Cleveland 17, Ohio. Price $1.00.

THIS NICELY prepared booklet contains a great deal of useful material for the design of welded machine items. It shows comparative cast and welded designs, the relative costs, and how to go about calculating welded designs.

Nomographs illustrate the convenient transfer of cast design requirements to those needed for welded design. Additional nomographs deal with torsional resistance, angular twist, flywheel design and several other items.

Some of the principal topics of discussion are as follows: bearing support design, fillet weld design for horizontal shear due to bending, and steel design appraisal.

Electronics

PROCEEDINGS OF THE NATIONAL ELECTRONICS CONFERENCE. Size 9¼ by 6⅜ in.; 1087 pp; illustrated; cloth bound. Address order to: National Electronics Conference, 84 E. Randolph St., Chicago 1, Ill. Price $7.50.

NINETY-FOUR TECHNICAL papers presented at the Electronics Conference in Chicago in 1957 are reported fully in this book. Much of the material is highly technical.

Some of the principal topics under which the papers are grouped are as follows: transistor circuits, solid state, computers, radar and radio navigation, magnetic amplifiers and instrumentation.

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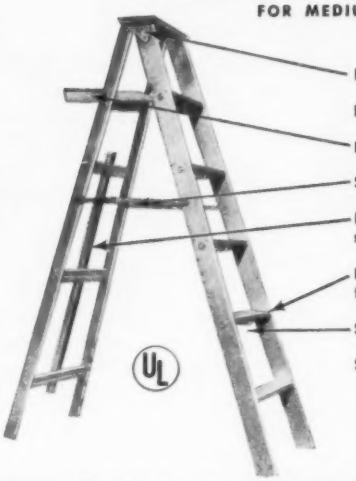

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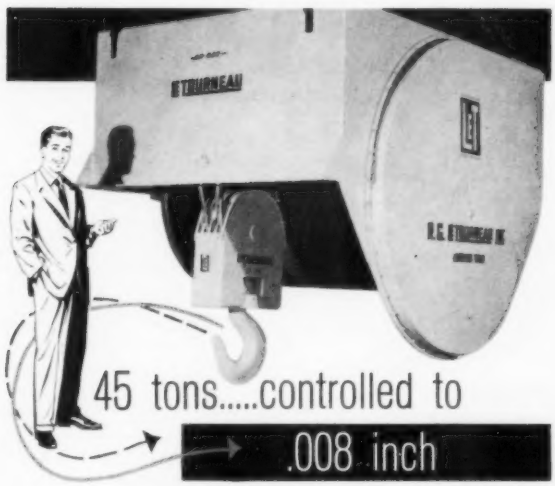

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Packaged Boiler Specifications

(Continued from page 117)

sound an alarm and light a signal light for audible and visual indication of flame failure. A safety shutdown shall require manual reset.

Control shall include set pre-purge and post-purge phases as recommended by the boiler manufacturer. In the event of failure of supply current the control shall be arranged to shut down the boiler and re-cycle on restoration of power. The device shall be actuated by the pilot and burner flame only and shall not in any way be controlled by combustion gases, hot refractory, or any other hot component of the boiler. The control shall bear the Underwriters' seal of approval. Failure of any component part of the control shall result in boiler shutdown.

Draft fan control shall function to provide pre-purging and post-purging. The controls shall be interlocked so that the burner cannot function until or unless the proper quantity of combustion air is available to the burner.

Failure of the fan through an interlock shall shut down the burner, and shall require manual reset. A manual switch shall be provided for manual purge of the furnace.

Feedwater Control

Water level regulator and low water cut-off shall be a float actuated device located at the side of the water column. It shall be piped with valves and fittings for ready replacement or repair. The device shall function to control electrically or mechanically the feedwater to the boiler. The low water cut-out shall function electrically to shut down the burner in the event of low water. Shutdown of burner due to low water shall require manual reset.

The draft fan installation shall be of the forced draft type with the capacity greater than that required for the burner at maximum boiler rating. The fan shall be capable of delivering a static pressure in excess of that required for the boiler with dirty tubes. The fan shall be readily accessible, balanced and quiet in operation, and shall conform to standards.

Electric motors shall be ball bearing, grease packed, splash-proof,

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unconditionally against breakage!

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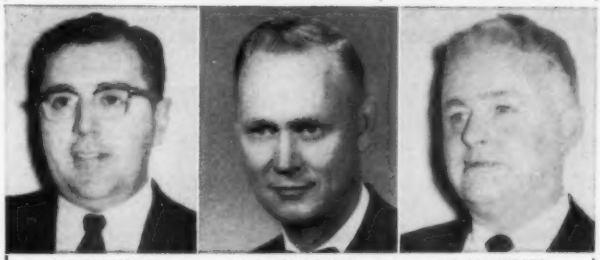

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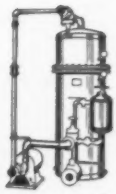

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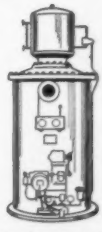

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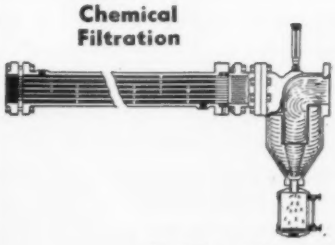

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and in accordance with the Standards of the National Electrical Manufacturers' Association for the service.

All exterior surfaces, including metal and insulation, shall be given two coats of paint over a suitable primer with colors as directed. Paint shall be certified by the manufacturer for the service and shall be suitable for the surface and temperature.

The boiler-burner unit shall be shop tested in accordance with the requirements of the applicable test code of the American Society of Mechanical Engineers. The purchaser shall be furnished a certified copy of test performance data. The field tests recommended by the boiler manufacturer shall be strictly adhered to and shall be conducted under the supervision of the representative of the manufacturer.

Boiler and all controls shall be the responsibility of the contractor through a complete heating season and for a period of not less than one year from date of initial acceptance by the purchaser.

All component parts shall be suitably identified by name plates. The contractor shall furnish a complete set of instructions and a wiring diagram in a glass framed enclosure for wall mounting in the boiler room. The contractor shall be responsible for instruction of the representative of the owner. **End**

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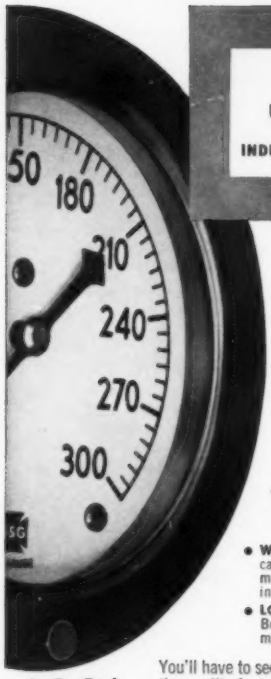

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If you can, a fortune in pearls is yours!

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We did it!

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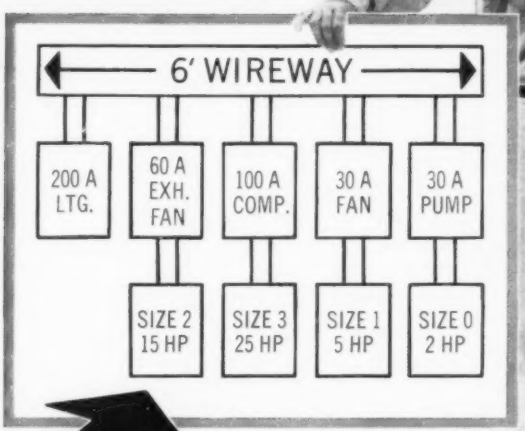

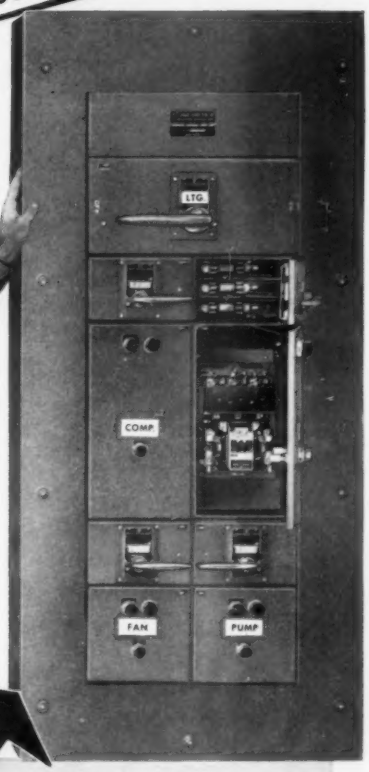

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41 HOURS AND 6 FEET
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IT TAKES
12 HOURS AND 30 INCHES
OF WALL SPACE FOR THE SAME INSTALLATION WITH A QMB STARTER PANELBOARD

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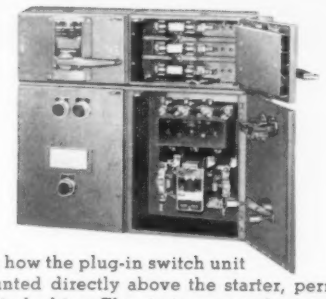

Notice how the plug-in switch unit is mounted directly above the starter, permitting interlocking. The starter cannot be opened when the switch is in the "ON" position.

It's easy to order these starter and switch units. See Page 57 in your Square D Digest and order from your distributor.

EC&M HEAVY INDUSTRY ELECTRICAL EQUIPMENT...NOW A PART OF THE SQUARE D LINE

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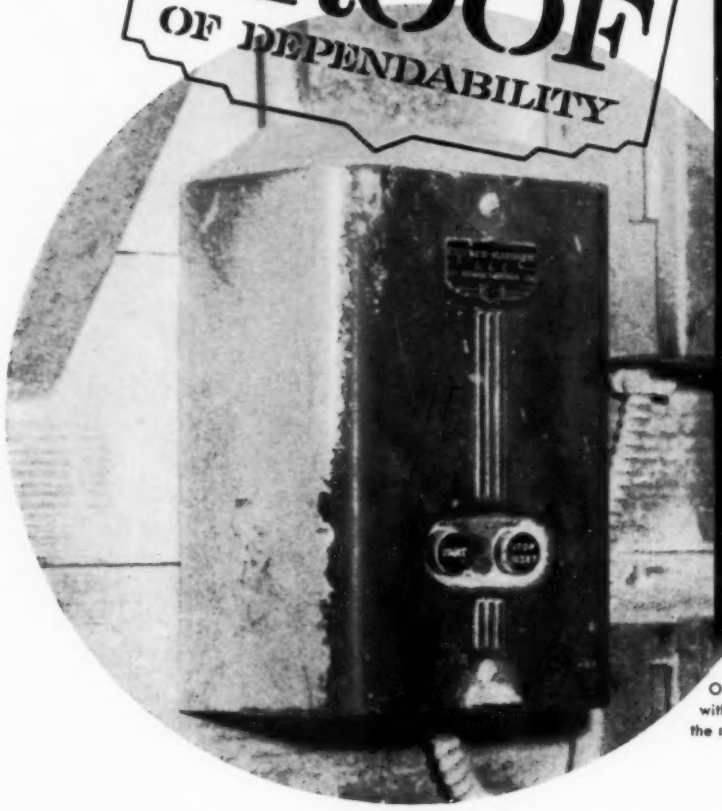

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